B777

Flight Crew Operations Manual

Vol 1

Revision No.9

Revision Date: 21 Jan 2010

SINGAPORE AIRLINES

CIVIL AVIATION AUTHORITY OF SINGAPORE

CAAS CONTROL PAGE

ORGANISATION : SINGAPORE AIRLINES LIMITED
MANUAL TITLE : B777 FCOM
DATE : 21 JAN 2010

SQ REVISION	LIST OF EFFECTIVE PAGES	DATE
FCOM VOL 1A		
Normal Procedures	SQ. LEP.2-8	21 Jan 2010
Airport Operations	SQ. LEP.8	21 Jan 2010
Communications	SQ. LEP.8-14	21 Jan 2010
Navigations & Route Procedures	SQ. LEP.14-15	21 Jan 2010
Performance	SQ. LEP.15-16	21 Jan 2010
Systems	SQ. LEP.16	21 Jan 2010
Special Operations	SQ. LEP.16-17	21 Jan 2010
Destinations & Alternates	SQ. LEP.17-19	21 Jan 2010
Airport Analysis	SQ. LEP.19-20	21 Jan 2010
QRH		
QRH	SQ. LEP.1- 6	21 Jan 2010
BOEING REVISION	**LIST OF EFFECTIVE PAGES**	**DATE**
FCOM Revision 34	0.5.1- 0.5.12	14 Dec 2009
QRH Revision 34	CI.LEP.1- 6	14 Dec 2009
B777-200/200ER/300 FPM Revision 13	0.3.1- 2	11 Dec 2009
B777-300ER FPM Revision 04	0.3.1- 2	11 Dec 2009
OMB SIA-00 R64	-	21 Dec 2009

CAAS APPROVED AND/OR ACCEPTED THE ABOVE LISTED AMENDMENTS/REVISIONS.

Capt Michael Hoh
Flight Operations Inspector (Airlines)
Airworthiness / Flight Operations

CAPT YEO BOON LING
CHIEF PILOT B777
SINGAPORE AIRLINES LIMITED
SINGAPORE

DATE: 09 FEB 2010

FLIGHT OPS INSPECTOR
CIVIL AVIATION AUTHORITY
SINGAPORE

DATE: 17/2/10

The Acceptance or Approval of amendments of Operational manuals by the Authority is subjected to Chapter 2 paragraph 1.8 of the Singapore AOCR.

SINGAPORE AIRLINES

FLIGHT OPERATIONS REVISION LETTER

18 FEB 2010

TO: ALL B777 FCOM HOLDERS

FROM: FTSE (O)

B777 FCOM REVISION AND CD-ROM ISSUE

This revision package contains:

- **For Crew**
  1. CD-ROM of Boeing Revision 34 and SQ Revision dated 21 Jan 2010
  2. QRH Revision

- **For Aircraft and Office Holders**
  1. CD-ROM of Boeing Revision 34 and SQ Revision dated 21 Jan 2010 (Office Holders only)
  2. FCOM Vol. 1, 1A, 2 revised pages (Aircraft and Office Holders)
  3. QRH revised pages (Aircraft and Office Holders)
  4. A set of CAAS-stamped Boeing LEPs
  5. A set of Boeing OMB SIA-00 R64 dated 21 Dec 2009
  6. A reprinted copy of Boeing page CI.RR.3-4 dated 14 Dec 2009

Note: Discard the old CD ROM dated 10 Jul 2009.

AFFECTED PUBLICATION	**SUBJECT**
FCOM Volume 1	Revision Record/Highlights, Bulletins, Limitations Boeing Chapters - Performance Dispatch and Performance Inflight
FCOM Volume 1A	SQ Normal and Supplementary Procedures Boeing Supplementary Procedures
FCOM Volume 2	Boeing Chapters
QRH	SQ Chapters, Boeing Chapters

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FILING INSTRUCTIONS (FOR CREW ONLY)

1. QRH

1.1 Discard the following pages from the shrink-wrapped pack:

- Boeing LEP pages CI.LEP.1-6 dated 14 Dec 2009
- Boeing Revision Record page CI.RR.3-4 dated 14 Dec 2009
- Back Cover.2 dated 14 Dec 2009.

1.2 Replace the affected Boeing QRH pages with the revised pages. Do not discard Back Cover.2 dated 15 Jun 2009.

1.3 Replace the affected SQ QRH pages with the revised pages.

1.4 Insert the reprinted Boeing page CI.RR.3-4 dated 14 Dec 2009.

1.5 Insert a set of CAAS-stamped Boeing QRH LEPs after Chapter Checklist Instructions - Revision Record page CI.RR.4.

SINGAPORE AIRLINES

FILING INSTRUCTIONS (FOR OFFICE HOLDERS AND AIRCRAFT ONLY)

1. CAAS APPROVAL REFERENCE

1.1 Replace the previous CAAS control page with the CAAS control page dated 21 Jan 2010.

2. QRH

2.1 Discard the following pages from the shrink-wrapped pack:
- Boeing LEP pages CI.LEP.1-6 dated 14 Dec 2009
- Boeing Revision Record page CI.RR.3-4 dated 14 Dec 2009
- Back Cover.2 dated 14 Dec 2009.

2.2 Replace the affected Boeing QRH pages with the revised pages. Do not discard Back Cover.2 dated 15 Jun 2009.

2.3 Replace the affected SQ QRH pages with the revised pages.

2.4 Insert the reprinted Boeing page CI.RR.3-4 dated 14 Dec 2009.

2.5 Insert a set of CAAS-stamped Boeing QRH LEPs after Chapter Checklist Instructions - Revision Record page CI.RR.4.

3. FCOM Volume 1

3.1 Discard Boeing LEP pages 0.5.1-12 from the shrink-wrapped pack.

3.2 Amend the affected Boeing pages from the shrink-wrapped pack as per CAAS-stamped Boeing's LEPs.

3.3 Insert a set of CAAS-stamped Boeing LEPs after the Boeing V1V2 Revision Record Chapter 0, Section 4 page 0.4.16.

4. FCOM Volume 1A

4.1 Insert the "CAAS Approvals" cover note as the first page of FCOM Vol 1A.

4.2 Replace the entire SQ pages with the complete revised set.

4.3 Amend the affected Boeing Supplementary Procedures pages from the shrink-wrapped pack as per CAAS-stamped Boeing's LEPs.

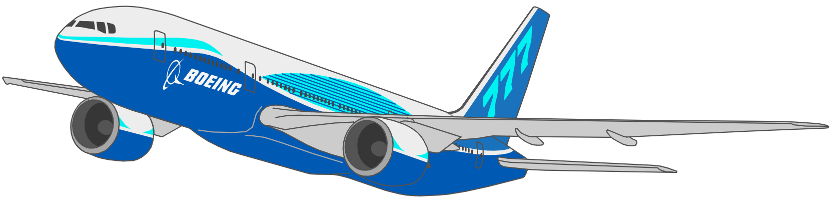
SINGAPORE AIRLINES

5 FCOM Volume 2

5.1 Insert the "CAAS Approvals" cover note as the first page of FCOM Vol 2.

5.2 Amend the affected Boeing pages from the shrink-wrapped pack as per CAAS-stamped Boeing's LEPs.

Seah Jing Yee
for Vice President/Chief Pilot B777
Flight Operations



777-212/-312/-312ER

Flight Crew Operations Manual

Singapore Airlines Ltd.

Document Number D632W001-SIA
November 07, 1996

Revision Number: 34
Revision Date: December 14, 2009

December 14, 2009

Preface — Chapter 0

Revision Notice — Section RevNotice

PAPER manuals

This is a PARTIAL revision. Only revised pages and their associated backing pages are printed. Be careful not to discard unchanged pages from previous revisions, or bulletins you may have received while this revision was being printed and shipped.

DIGITAL data

For customers receiving digital data by way of CD or MyBoeingFleet, there are files of only revised pages and files of the complete manuals (volume 1, volume 2 and the QRH). During the assembly process, revision bars from previous revisions are removed from the pages of the complete manuals files. These pages are not reprinted and shipped with the paper manuals unless they contain new changes.

Intentionally
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Volume 1

Volume 2

Preface — Chapter 0
V1V2 Model Identification — Section 1

General

The airplanes listed in the table below are covered in this manual. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
001	9V-SQA	28507	WB181
002	9V-SQB	28508	WB182
003	9V-SQC	28509	WB183
004	9V-SQD	28510	WB184
005	9V-SQE	28511	WB185
006	9V-SQF	28512	WB186
012	9V-SQG	28518	WB187
013	9V-SQH	28519	WB188
020	9V-SQI	28530	WB189
021	9V-SQJ	30875	WB190
023	9V-SQK	33368	WB191
192	9V-SQL	33370	WB192
193	9V-SQM	33372	WB193
194	9V-SQN	33373	WB194
007	9V-SRA	28513	WB231
008	9V-SRB	28998	WB232

Airplane Number	Registry Number	Serial Number	Tabulation Number
009	9V-SRC	28999	WB233
010	9V-SRD	28514	WB234
011	9V-SRE	28523	WB235
014	9V-SRF	28521	WB236
015	9V-SRG	28522	WB237
016	9V-SRH	30866	WB238
017	9V-SRI	30867	WB239
018	9V-SRJ	28527	WB240
019	9V-SRK	28529	WB241
022	9V-SRL	32334	WB242
024	9V-SRM	32320	WB243
025	9V-SRN	32318	WB244
026	9V-SRO	32321	WB245
027	9V-SRP	33369	WB246
028	9V-SRQ	33371	WB247
201	9V-SVA	28524	WB201
202	9V-SVB	28525	WB202
203	9V-SVC	28526	WB203
204	9V-SVD	30869	WB204
205	9V-SVE	30870	WB205
206	9V-SVF	30871	WB206
207	9V-SVG	30872	WB207
208	9V-SVH	28532	WB208
209	9V-SVI	32316	WB209
210	9V-SVJ	32335	WB210
211	9V-SVK	28520	WB211
212	9V-SVL	32336	WB212

Airplane Number	Registry Number	Serial Number	Tabulation Number
213	9V-SVM	30874	WB213
214	9V-SVN	30873	WB214
215	9V-SVO	28533	WB215
901	9V-SWA	34568	WD691
902	9V-SWB	33377	WD692
903	9V-SWD	34569	WD693
904	9V-SWE	34570	WD694
905	9V-SWF	34571	WD695
906	9V-SWG	34572	WD696
907	9V-SWH	34573	WD697
908	9V-SWI	34574	WD698
909	9V-SWJ	34575	WD699
910	9V-SWK	34576	WD700
911	9V-SWL	34577	WD701
912	9V-SWM	34578	WD702
913	9V-SWN	34579	WD703
914	9V-SWO	34580	WD704
915	9V-SWP	34581	WD705
916	9V-SWQ	34582	WD706
917	9V-SWR	34583	WD707
918	9V-SWS	34584	WD708
919	9V-SWT	34585	WD709
501	9V-SYA	28515	WB611
502	9V-SYB	28516	WB612
503	9V-SYC	28517	WB613
504	9V-SYD	28534	WB614
505	9V-SYE	28531	WB615

Airplane Number	Registry Number	Serial Number	Tabulation Number
506	9V-SYF	30868	WB616
507	9V-SYG	28528	WB617
508	9V-SYH	32317	WB618
509	9V-SYI	32327	WB619
510	9V-SYJ	33374	WB620
511	9V-SYK	33375	WB621
512	9V-SYL	33376	WB622

General

This Flight Crew Operations Manual (FCOM) has been prepared by Boeing Commercial Airplanes, Commercial Aviation Services organization. The purpose of this FCOM is to:

- provide the operating limitations, procedures, performance, and systems information the flight crew needs to safely and efficiently operate the 777 airplane during all anticipated airline operations
- serve as a comprehensive reference for use during transition training for the 777 airplane
- serve as a review guide for use in recurrent training and proficiency checks
- provide necessary operational data from the FAA approved Airplane Flight Manual (AFM) to ensure that legal requirements are satisfied
- establish standardized procedures and practices to enhance Boeing operational philosophy and policy.

This manual is prepared for the owner/operator named on the title page specifically for the airplanes listed in the "Model Identification" section. It contains operational procedures and information, which apply only to these airplanes. The manual covers the Boeing delivered configuration of these airplanes. Changes to the delivered configuration are incorporated when covered by contractual revision agreements between the owner/operator and The Boeing Company.

This manual is not suitable for use for any airplanes not listed in the "Model Identification" section. Further, it may not be suitable for airplanes that have been transferred to other owners/operators.

Owners/operators are solely responsible for ensuring the operational documentation they are using is complete and matches the current configuration of the listed airplanes. This includes the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in the operational procedures and information contained in this manual.

The manual is structured in a two-volume format with a Quick Reference Handbook (QRH). Volume 1 includes operational limitations, normal and supplementary procedures, and dispatch performance data. Volume 2 contains systems information. The QRH contains all checklists necessary for normal and non-normal procedures as well as in-flight performance data.

The manual is periodically revised to incorporate pertinent procedural and systems information. Items of a more critical nature will be incorporated in operational bulletins and distributed in a timely manner. In all cases, such revisions and changes must remain compatible with the approved AFM with which the operator must comply. In the event of conflict with the AFM, the AFM shall supersede.

This manual is written under the assumption that the user has had previous multi–engine jet aircraft experience and is familiar with basic jet airplane systems and basic pilot techniques common to airplanes of this type. Therefore, the manual does not contain basic flight information that is considered prerequisite training.

Any questions about the content or use of this manual can be directed to:

Boeing Commercial Airplanes
Commercial Aviation Services
Attention: 777 Manager, Flight Technical Data
P.O. Box 3707, M/C 20-89
Seattle, Washington 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743

Organization

The FCOM is organized in the following manner.

Volume 1 –

- Preface – contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions, bulletins, and a list of effective pages.
- Limitations and Normal Procedures chapters cover operational limitations and normal procedures. All operating procedures are based on a thorough analysis of crew activity required to operate the airplane, and reflect the latest knowledge and experience available.
- Supplementary Procedures chapter covers those procedures accomplished as required rather than routinely on each flight.
- Performance Dispatch chapter contains performance information necessary for self dispatch.
- Performance Inflight chapter contains performance information necessary for inflight use.

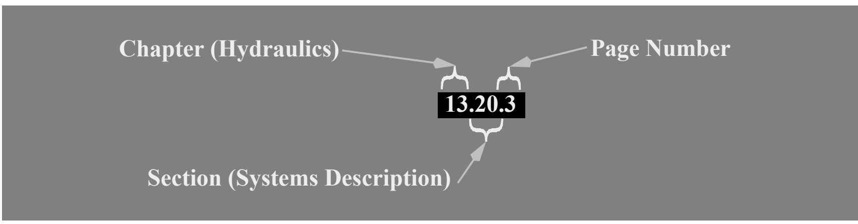
Volume 2 – Chapters 1 through 15 contain general airplane and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

Quick Reference Handbook (QRH) – The QRH contains normal checklists, non-normal checklists, operational information, performance information necessary for inflight use on an expedited basis, and maneuvers.

Page Numbering

The FCOM uses a decimal page numbering system. The page number is divided into three fields; chapter, section, and page. An example of a page number for the hydraulics chapter follows: chapter 13, section 20, page 3.

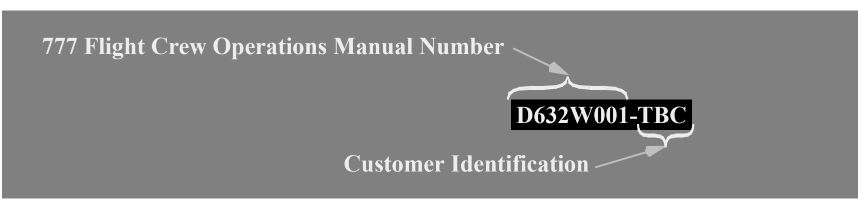
Example Page Number



Page Identification

Each page is identified by a customer document number and a page date. The customer document number is composed of the general 777 FCOM number, D632W001–, and is followed by the customer identification.

Example Page Identification



Warnings, Cautions, and Notes

The following levels of written advisories are used throughout the FCOM and are not to be confused with EICAS messages, which are separately identified in the text.

WARNING: An operating procedure, technique, etc., that may result in personal injury or loss of life if not carefully followed.

CAUTION: An operating procedure, technique, etc., that may result in damage to equipment if not carefully followed.

Note: An operating procedure, technique, etc., considered essential to emphasize. Information contained in notes may also be safety related.

Flight Crew Operations Manual Configuration

Customer airplane configuration determines the data provided in this manual. The Boeing Company keeps a list of each airplane configuration as it is built and modified through the Service Bulletin process. The FCOM does not reflect customer originated modifications without special contract provisions.

Special Note

This FCOM contains information which has been included at the request of your airline for airplanes covered by this manual. This information may differ from Boeing recommended information. By including this information in the manual, Boeing is providing a publishing service only and such inclusion does not imply that The Boeing Company in any way endorses or approves such information. The technical accuracy and validity of all such airline originated information, and its effect, if any, on other portions of this manual, is the sole responsibility of the airline.

All airline originated information is uniquely identified by revision dots as shown in the margin of this paragraph.

Airplane Effectivities

Differences in airplane configuration are shown by use of airplane effectivities throughout Flight Crew Operations Manual Volumes 1, 1A and 2, and the Quick Reference Handbook. The following rules are used to express airplane effectivities:

1. Airplane effectivies are listed by tail numbers in alpha-numeric order. A range of airplanes is defined by a dash, e.g. **9V-SQA - 9V-SRQ** includes all "SQ" series airplanes and all "SR" series airplanes up to 9V-SRQ. A comma in the effectivity range indicates a break in the range, e.g. **9V-SQA - 9V-SQC, 9V-SQE - 9V-SQN**; that is, airplane 9V-SQD is excluded from the range.
2. Airplane effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any).

Example (with subordinate items):

9V-AAA - 9V-BBB
If FUEL DISAGREE-PROG 2/3 CDU scratchpad message displayed:

PROGRESS PAGE 2/3.......................................SELECT
TOTALIZER...SELECT USE

Use TOTALIZER to determine fuel remaining.

Note: After engine shutdown, all remaining fuel can be used for the operating engine. Resume normal fuel management procedures. Plan to balance fuel when the FUEL IMBALANCE message is displayed.

In this example, the first procedural step (If FUEL DISAGREE-PROG 2/3 CDU...) and its further indented (subordinate) steps apply to 9V-AAA - 9V-BBB only. The next equivalently indented step (Note: After engine shutdown...) applies to all airplanes.

Example (without subordinate items):

[ ] HYD PRESS SYS L + R

Condition: **Left and right hydraulic system pressure are low.**

9V-XXX - 9V-YYY
Do not exceed .87M.
[Ensures sufficient roll control]

LEFT DEMAND PUMP SELECTOR................................ON
[Restores system pressure if AUTO demand function failed to operate.]

RIGHT DEMAND PUMP SELECTOR..............................ON
[Restores system pressure if AUTO demand function failed to operate.]

In this example, the first procedural step (Do not exceed .87M) applies to 9V-XXX - 9V-YYY only. The equivalently indented steps thereafter (LEFT DEMAND PUMP.....; RIGHT DEMAND PUMP...) apply to all airplanes.

3. When airplane effectivities are stated immediately below a checklist, the entire checklist applies to the listed airplanes only. In the following example, the SMOKE CREW REST MAIN checklist is applicable to 9V-XXX - 9V-YYY only.

SMOKE CREW REST MAIN

9V-XXX - 9V-YYY

Condition: **Smoke is detected in the main deck crew rest compartment.**

4. When Boeing has been notified airplanes are to be modified by service bulletin (SB), the effectivity statement will include 'before' and 'after' versions, as appropriate, in parentheses. Depending upon the modification, there may not be both a 'before' and an 'after' version.

   The text before the semicolon in the parentheses lists the range of airplanes being modified. The text after the semicolon indicates the 'before' or 'after' version and briefly describes what the SB does. The following examples illustrate this:

Example ('before' version):

(SB changes 9V-AAA - 9V-BBB; before SB, IFE/PASS SEATS and CABIN/UTILITY power switches not installed.)
If smoke/fumes/fire persists or source unknown:

CABIN READING AND GALLEY ATTENDANT WORK LIGHTS..ON

"SB changes 9V-AAA - 9V-BBB" means the incorporation of the SB (i.e. installation of IFE/PASS SEATS and CABIN/UTILITY power switches in this example) has been scheduled to begin for airplanes 9V-AAA - 9V-BBB.

"before SB, IFE/PASS SEATS and CABIN/UTILITY power switches not installed" indicates that the associated procedural step (If smoke/fumes/fire persists or source unknown:) and its subordinate step (CABIN READING....) apply to 9V-AAA - 9V-BBB if the SB has not yet been incorporated.

Example ('after' version):

9V-XXX - 9V-YYY
(SB changes 9V-AAA - 9V-BBB; IFE/PASS SEATS and CABIN/UTILITY power switches installed.)
If smoke/fumes/fire persists or source unknown:

IN-FLIGHT ENTERTAINMENT SYSTEM/PASSENGER SEATS POWER SWITCH...OFF

"9V-XXX - 9V-YYY" means that the SB (i.e. installation of IFE/PASS SEATS and CABIN/UTILITY power switches in this example) has already been incorporated on 9V-XXX - 9V-YYY.

"SB changes 9V-AAA - 9V-BBB" means the incorporation of the SB (i.e. installation of IFE/PASS SEATS and CABIN/UTILITY power switches in this example) has been scheduled to begin for airplanes 9V-AAA - 9V-BBB.

"IFE/PASS SEATS and CABIN/UTILITY power switches installed" indicates that the associated procedural step (If smoke/fumes/fire persists or source unknown:) and its subordinate step (IN-FLIGHT ENTERTAINMENT...) apply to 9V-AAA - 9V-BBB if the SB has been incorporated.

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General

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used.

A	
ABV	Above
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACP	Audio Control Panel
ACT	Active
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
AFDS	Autopilot Flight Director System
AFM	Airplane Flight Manual (FAA approved)
A/G	Air/Ground
AGL	Above Ground Level
AIL	Aileron
ALT	Altitude
ALTN	Alternate
AM	Amplitude Modulation
AMI	Airline Modifiable Information
ANP	Actual Navigational Performance
ANT	Antenna
AOA	Angle of Attack
A/P	Autopilot
APL	Airplane
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ASA	Autoland Status Annunciator
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATT	Attitude
AUTO–THROT	Autothrottle
AUTO	Automatic

AUX	Auxiliary
AVAIL	Available
B	
BARO	Barometric
BAT	Battery
B/CRS	Back Course
BFO	Beat Frequency Oscillator
BKR	Breaker
BLD	Bleed
BLW	Below
BRG	Bearing
BRT	Bright
BTL	Bottle
C	
C	Captain Celsius Center Cool
CANC	Cancel
CAP	Capture
CAPT	Captain
CB	Circuit Breaker
CDU	Control Display Unit
CG	Center of Gravity
CHR	Chronograph
CKT	Circuit
CL	Close
CLB	Climb
CLR	Clear
CMD	Command
CO	Company
COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control
COOL	Cooling
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CTL	Control
CTR	Center
CWS	Control Wheel Steering
D	
DA(H)	Decision Altitude (Height)
DC	Direct Current
DDG	Dispatch Deviations Guide
DEL	Delete
DEP	Departure
DEPR	Depressurize
DES	Descent
DH	Decision Height
DIFF	Differential
DISC	Disconnect
DISCH	Discharge
DK	Deck
DME	Distance Measuring Equipment

DN	Down
DSPL	Display
E	
E/D	End of Descent
E/E	Electrical/Electronic
EEC	Electronic Engine Control
EFI	Electronic Flight Instruments
EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
ENT	Entry
EO	Engine Out
EPR	Engine Pressure Ratio
EQPT or EQUIP	Equipment
ETOPS	Extended Range Operation with Twin Engine Airplanes
EVAC	Evacuation
EXEC	Execute
EXT	Extend or External
F	
F	Fahrenheit
FADEC	Full Authority Digital Engine Control
FCC	Flight Control Computer
FCOM	Flight Crew Operations Manual
FD, F/D or FLT DIR	Flight Director
FF	Fuel Flow
FILT	Filter
FL CH or FLCH	Flight Level Change
FLT	Flight
FMA	Flight Mode Annunciations
FMC	Flight Management Computer
FMS	Flight Management System
F/O or F O	First Officer
FPA	Flight Path Angle
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
F/S	Fast/Slow
FT	Feet
FWD	Forward
FWSOV	Fire Wall Shut Off Valve
G	
GA	Go–Around
GEN	Generator
GMT	Greenwich Mean Time
GND	Ground

GPS	Global Positioning System
GPWS	Ground Proximity Warning System
G/S	Glide Slope
GS	Ground Speed
H	
HDG	Heading
HF	High Frequency
HI	High
HLD	Hold
HPSOV	High Pressure Shut Off Valve
HSI	Horizontal Situation Indicator
HYD	Hydraulic
I	
IAS	Indicated Airspeed
IDENT	Identification
IGN	Ignition
IGS	Instrument Guidance System
IND LTS	Indicator Lights
INIT	Initialization
INSTR	Instrument
ILS	Instrument Landing System
INBD	Inboard
IND	Indicator
INOP	Inoperative
INT or INTPH	Interphone
INTC	Intercept

IRS	Inertial Reference System
ISA	International Standard Atmosphere
ISLN	Isolation
ISFD	Integrated Standby Flight Display
K	
K or KTS	Knots
KGS	Kilograms
L	
L	Left
LBS	Pounds
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LE	Leading Edge
LIM	Limit
LKD	Locked
L NAV or LNAV	Lateral Navigation
LOC	Localizer
LT	Light
M	
M	Mach
MAG	Magnetic
MAN	Manual
MAX	Maximum
MCP	Mode Control Panel
MDA(H)	Minimum Descent Altitude (Height)

MEL	Minimum Equipment List
MFD	Multifunction Display
MIC	Microphone
MIN	Minimum
MLS	Microwave Landing System
MMO	Maximum Mach Operating Speed
MOD	Modify
MSG	Message
N	
N	Normal
NAV	Navigation
NM	Nautical Miles
NORM	Normal
NPS	Navigation Performance Scales
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed (Pratt & Whitney engines) Intermediate Pressure Rotor Speed (Rolls–Royce engines)
N3	High Pressure Rotor Speed (Rolls–Royce engines)
O	
OAT	Outside Air Temperature
OFST	Offset
OP	Open
OVHT	Overheat
OVRD	Override
OVSPD	Overspeed
OXY or O2	Oxygen
P	
PA	Passenger Address
PASS	Passenger
PCP	Pilot Call Panel
PERF	Performance
PES	Pitch Enhancement System
PF	Pilot Flying
PM	Pilot Monitoring
PNL	Panel
POS	Position
PPOS	Present Position
PRES or PRESS	Pressure
PREV	Previous
P/RST	Push To Reset
PROX	Proximity
PRV	Pressure Regulating Valve
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System
Q	
Q	Quantity

QFE	Local Station Pressure
QNH	Local Station Pressure corrected to MSL
QTY	Quantity
R	
R	Right
RA	Radio Altitude Resolution Advisory
RAD	Radio
RAT	Ram Air Turbine
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
REV	Reverse
RF	Refill
RMI	Radio Magnetic Indicator
RNP	Required Navigational Performance
RNV	Area Navigation (RNAV)
RPM	Revolutions Per Minute
RST	Reset
RSVR	Reservoir
R/T	Radio Transmit
RTE	Route
RTO	Rejected Takeoff
RUD	Rudder
RVSM	Reduced Vertical Separation Minimum
S	
SAT	Static Air Temperature
SB	Service Bulletin
S/C	Step Climb
SEL	Select
SDF	Simplified Directional Facility
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SPD	Speed
SPDBRK	Speedbrake
STAB	Stabilizer
STBY	Standby
SYS	System
T	
T or TRU	True
T or TK or TRK	Track
TA	Traffic Advisory
TAI	Thermal Anti–Ice
TAT	Total Air Temperature
T/C	Top of Climb
TCAS	Traffic Alert and Collision Avoidance System
T/D	Top of Descent
TE	Trailing Edge
TEMP	Temperature
TERR	Terrain
TFC	Traffic
TFR	Transfer

THR	Throttle Thrust
TO or T/O	Takeoff
TO/GA	Takeoff/Go–Around
TURB	Turbine Turbulence
U	
UNLKD	Unlocked
UNSCHD or UNSCHED	Unscheduled
USB	Upper Side Band
UTC	Universal Time Coordinated
UTIL	Utility
V	
VA	Design maneuvering Speed
VAL	Valve
VERT	Vertical
VHF	Very High Frequency
VIB	Vibration
VLV	Valve
VMO	Maximum Operating Speed
V NAV or VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed
VSI	Vertical Speed Indicator
V/S	Vertical Speed
VTK	Vertical Track
V1	Takeoff Decision Speed
V2	Takeoff Safety Speed
W	
W	Warm
WHL	Wheel
WPT	Waypoint
WXR	Weather Radar
X	
X–FEED	Crossfeed
XPDR or XPNDR	Transponder
XTK	Cross Track

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Revision Transmittal Letter

To: All holders of Singapore Airlines Ltd. 777 Flight Crew Operations Manual (FCOM), Boeing Document Number D632W001-SIA.

Subject: Flight Crew Operations Manual Revision.

This revision reflects the most current information available to The Boeing Company 45 days prior to the subject revision date.

Most of the panel pages in sections 1.21 and 1.23 have been reissued for administrative consolidation purposes. There are no technical changes on those pages unless a revision bar appears on the page.

General information below explains the use of revision bars to identify new or revised information. Highlights in the Revision Highlights section explain the revision bar changes in this revision.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
01	January 15, 1997		02	March 11, 1997	
03	April 23, 1997		04	August 18, 1997	
05	December 10, 1997		06	May 4, 1998	
07	August 10, 1998		08	October 9, 1998	
09	December 18, 1998		10	July 1, 1999	
11	December 9, 1999		12	June 26, 2000	
13	December 11, 2000		14	March 1, 2001	
15	June 18, 2001		16	August 15, 2001	
17	September 17, 2001		18	December 7, 2001	
19	June 17, 2002		20	December 16, 2002	
21	June 16, 2003		22	December 15, 2003	
23	June 14, 2004		24	December 13, 2004	
25	June 13, 2005		26	December 12, 2005	
27	June 12, 2006		28	December 11, 2006	

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
29	June 11, 2007		30	December 10, 2007	
31	June 16, 2008		32	December 15, 2008	
33	June 15, 2009		34	December 14, 2009	

General

The Boeing Company issues flight crew operations manual revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued flight crew operations manual bulletins.

The revision date is the approximate date the manual is mailed to the customer.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the manual content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Highlights in the Revision Highlights section provide descriptions of the changes identified by the revision bars. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

Filing Instructions

Consult the List of Effective Pages (0.5). Pages identified with an asterisk (*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the List of Effective Pages (0.5) can help determine the correct content of the manual.

After the revision has been filed into the manuals, the revision number, revision date and the date the revision was filed should be recorded in the Revision Record table above by the person that filed the revision.

Revision Highlights

This section (0.4) replaces the existing section 0.4 in your manual.

Throughout the manual, airplane effectivity may be updated to reflect coverage as listed on the Preface - Model Identification page, or to show service bulletin airplane effectivity. Highlights for these airplane effectivity updates are not supplied.

This manual is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

Chapter 0 - Preface

Section 2 - Introduction

General

0.2.2 - Updated Boeing contact data.

Section 6 - Bulletin Record

0.6.2 - Revised to reflect current bulletin status.

Chapter B - Bulletins

Section 72 - Covers

B.72.4 - Added specific service bulletin number that corrects the anomaly and thus causes this operations manual bulletin to be cancelled.

Chapter L - Limitations

Section 10 - Operating Limitations

Operational Limitations

L.10.1 - Moved title out of table for cross model standardization.

Door Mounted Power Assists and Escape Slides

L.10.3 - Added door mounted power assists and evacuation slide systems arming requirement paragraph to reflect passenger airplanes with ARMED/DISARMED placard on the door mode select panel.

L.10.3 - Deleted MANUAL door mode paragraph to accommodate customer request.

Chapter SP - Supplementary Procedures

Refer to FCOM Vol 1A for these revision highlights.

Section 1 - Airplane General, Emer. Equip

Doors

SP.1.1 - Changed response of action line item from AUTOMATIC to ARMED to accommodate change in door mode select lever nomenclature in the fleet.

SP.1.1 - Changed response of action line item from MANUAL to DISARMED to accommodate change in door mode select lever nomenclature in the fleet.

Section 2 - Air Systems

Air Conditioning Packs

SP.2.1 - Corrected spelling of "Air Use" in title.

Section 11 - Flight Management, Navigation

Departure or Destination Airport Not in the FMC Navigation Database

SP.11.1 - Added a supplementary procedure to allow operators to land at and depart from airports not in the FMC navigation database.

ADIRU Alignment/Position Update

SP.11.5 - Revised; updated AIMS software displays only boxes.

Navaid Inhibit

SP.11.7 - Revised for consistency with Chapter 11.20.

SP.11.7 - Revised for consistency.

SP.11.7 - Deleted "all"; DME/DME updating is not inhibited.

Section 16 - Adverse Weather

Cold Weather Operations

SP.16.2 - Revised 1st bulleted line item to more clearly define the visibility parameter and be consistent with the AFM.

SP.16.4 - Added "ice" to the sentence for accuracy and consistency.

SP.16.4 - Incorporated minor revisions to Surfaces Check comment for standardization purposes and to add frost as one of the items that the upper wing surfaces must be free of.

Chapter PD - Performance Dispatch

Refer to FCOM Vol 1 for these revision highlights.

Section 10 - Takeoff

Takeoff Field Corrections

PD.10.1 - Revised takeoff field corrections data to extend takeoff field and climb limit weights to 8000 feet.

Takeoff Field & Climb Limit Weights

PD.10.2 - Revised takeoff field and climb limit weights tables and bleed corrections for altitude coverage to 8000 feet.

PD.10.3-4 - Revised takeoff field and climb limit weights data to extend the altitude coverage to 8000 feet.

Takeoff Obstacle Limit Weight

PD.10.5 - Revised takeoff obstacle limit weight and revised anti-ice adjustment to add altitude coverage to 8000 feet.

Takeoff Speeds

PD.10.7 - Revised takeoff speeds V1, VR, V2 adjustments table to add altitude coverage to 8000 feet.

PD.10.8 - Revised takeoff speeds V1(MCG), Minimum VR table to add altitude coverage to 8000 feet.

Section 12 - Landing

Landing Climb Limit Weight

PD.12.3 - Revised landing climb limit weight table for altitude coverage to 8000 feet, icing decrement revised to 20250 kg and engine and wing anti-ice adjustments to 1550 kg.

Section 13 - Gear Down

Takeoff Climb Limit Weight

PD.13.1 - Revised gear down takeoff climb limit weight table for altitude coverage to 8000 feet.

Landing Climb Limit Weight

PD.13.2 - Revised gear down landing climb limit weight table for altitude coverage to 8000 feet.

Takeoff Obstacle Limit Weight

PD.13.3-4 - Revised gear down takeoff obstacle limit weight for altitude coverage to 8000 feet and minimum flight path gradient limit.

Section 14 - Text

Takeoff

PD.14.3 - Inserted text concerning AFM analysis which was inadvertently deleted in the last revision

Section 20 - Takeoff

Takeoff Field & Climb Limit Weights

PD.20.2 - Revised takeoff field and climb limit weights tables and bleed corrections for altitude coverage to 8000 feet.

PD.20.3-4 - Revised takeoff field and climb limit weights data to extend the altitude coverage to 8000 feet.

Brake Energy Limits VMBE

PD.20.7 - Corrected weight reference in footnote.

Takeoff Speeds

PD.20.8 - Revised takeoff speeds V1, VR, V2 adjustments table to add altitude coverage to 8000 feet.

PD.20.9 - Revised takeoff speeds V1(MCG), Minimum VR table to add altitude coverage to 8000 feet.

Section 22 - Landing

Landing Climb Limit Weight

PD.22.3 - Revised landing climb for altitude coverage to 8000 feet and revised E and W A/I decrement and icing decrement.

Section 23 - Gear Down

Takeoff Climb Limit Weight

PD.23.1 - Revised gear down takeoff climb limit weight table for altitude coverage to 8000 feet.

Takeoff Obstacle Limit Weight

PD.23.3-4 - Revised gear down takeoff obstacle limit weight for altitude coverage to 8000 feet.

Section 24 - Text

Takeoff

PD.24.3 - Inserted text concerning AFM analysis which was inadvertently deleted in the last revision

Section 30 - Takeoff

Takeoff Field & Climb Limit Weights

PD.30.2-4 - Revised takeoff field and climb limit weights tables for altitude coverage to 8000 feet and field engine bleed limit weight adjustments.

Takeoff Obstacle Limit Weight

PD.30.5 - Revised takeoff obstacle limit weight pressure altitude adjustments table for altitude coverage to 8000 feet.

Section 32 - Landing

Landing Climb Limit Weight

PD.32.3 - Revised landing climb limit weight table for altitude coverage to 8000 feet and revised bleed corrections to match FPPM/PI.

Section 33 - Gear Down

Takeoff Climb Limit Weight

PD.33.1 - Revised takeoff climb limit for altitude coverage to 8000 feet.

Landing Climb Limit Weight

PD.33.2 - Revised landing climb limit table for altitude coverage to 8000 feet.

Takeoff Obstacle Limit Weight

PD.33.3-4 - Revised gear down takeoff obstacle limit weight for altitude coverage to 8000 feet.

Section 34 - Text

Takeoff

PD.34.3 - Inserted text concerning AFM analysis which was inadvertently deleted in the last revision

Section 44 - Text

Takeoff

PD.44.3 - Inserted text concerning AFM analysis which was inadvertently deleted in the last revision

Chapter PI - Performance Inflight

Section 22 - Advisory Information

Landing Climb Limit Weight

PI.22.8 - Revised landing climb limit weight, engine and wing anti-ice decrement and icing condition decrement.

Section 32 - Advisory Information

Recommended Brake Cooling Schedule

PI.32.9 - Revised recommended brake cooling schedule for altitude coverage to 8000 feet.

Chapter 1 - Airplane General, Emergency Equipment, Doors, Windows

Section 30 - Controls and Indicators

Refer to FCOM Vol 2 for these revision highlights.

Alternate Action Switches

1.30.1 - Revised to reflect only the top half of the switch is blank when in the off position for accuracy.

Entry Door

1.30.14 - Changed reference to where information is located to section title for clarity.

Overwing Emergency Exit Door

1.30.15 - Added overwing Emergency Exit Door section to accurately reflect the overwing emergency exits.

Door Mode Select Panel

1.30.17 - Added door mode select panel graphic to reflect ARMED/DISARMED placard installed.

1.30.17 - Deleted Door Mode select graphic. No longer applicable to fleet configuration.

1.30.17 - Added door mode select panel callout to reflect ARMED/DISARMED placard installed.

1.30.17 - Deleted door mode AUTOMATIC callout. No longer applicable to fleet configuration.

1.30.17 - Added DISARMED mode callout to reflect ARMED/DISARMED placard installed.

1.30.18 - Deleted MANUAL mode callout. No longer applicable to fleet configuration.

1.30.18 - Added Door Mode Select lever description to reflect ARMED/DISARMED placard installed.

1.30.18 - Deleted Door Mode Select Lever description. No longer applicable to fleet configuration.

Section 40 - Systems Description

Lighting Systems

1.40.1 - Changed "chapter" to "section" for consistency.

Master Brightness Control System

1.40.5 - Consolidated redundant information. No technical change.

Cabin Signs

1.40.7 - Revised wording for when the FASTEN SEAT BELT signs illuminate for clarity.

Section 45 - Emergency Equipment

Emergency Equipment Overview

1.45.1 - Removed bullet covering escape ropes; escape ropes covered in Section 1.50, Doors, Windows, Seats.

Passenger Airplane

1.45.2 - Paragraph revised: added "portable emergency equipment" to clarify statement.

Portable Oxygen Bottles

1.45.4 - Removed flashlight coverage; flight attendant information inadvertently added.

Section 46 - Overhead Crew Rest

Main Control Panel

1.46.6 - Added bullet to reflect current system operation: pushing Airflow / Smoke Reset switch resets aft galley electrical power in 777-300ER airplanes only.

Crew Rest Smoke Detection System

1.46.19 - Added bullet to reflect current system operation: smoke detection system removes aft galley electrical power in 777-300ER airplanes only.

Entrance Enclosure Control Panel

1.46.29 - Added bullet to reflect current system operation: pushing Airflow / Smoke Reset switch resets aft galley electrical power in 777-300ER airplanes only.

Crew Rest Smoke Detection System

1.46.36 - Added bullet to reflect current system operation: smoke detection system removes aft galley electrical power in 777-300ER airplanes only.

Section 50 - Doors, Windows, Seats

Flight Deck Number Two Windows

1.50.3 - Added escape rope information removed from 1.45 during the last revision.

Entry Doors

1.50.5 - Revised for accuracy to reflect overwing exit doors are emergency exits only.

1.50.5 - Added overwing exit door paragraph to accurately reflect 777-300 and 777-300ER airplanes.

Entry Door Slide/Raft

1.50.5 - Revised title for accuracy due to section reorganization.

Overwing Escape Slide

1.50.6 - Added overwing escape slide section to accurately describe the overwing escape slide.

Emergency Exit Operation

1.50.6 - Revised emergency exit description for accuracy and clarity.

1.50.6 - Added DISARMED door mode paragraph to reflect ARMED/DISARMED placard installed.

1.50.6 - Deleted MANUAL door mode paragraph. No longer applicable to fleet configuration.

1.50.9 - Added door 3 life line section to incorporate additional emergency equipment information applicable to 777-300 and 777-300ER airplanes.

Chapter 2 - Air Systems

Section 10 - Controls and Indicators

Air Conditioning Panel

2.10.3 - Corrected APU to pack takeoff description.

Bleed Air System

2.10.9 - Corrected switch position to "Off."

Chapter 3 - Anti-Ice, Rain

Section 10 - Controls and Indicators

Engine and Wing Anti Ice

3.10.1 - Moved Anti-Ice Indications on EICAS Display from section 7.10.

Anti–Ice Indications

3.10.2 - Moved Anti-Ice Indications on EICAS Display from section 7.10.

Chapter 4 - Automatic Flight

Section 10 - Controls and Indicators

Autopilot Flight Director System Controls

4.10.3 - corrected typographical error; deleted space after "TRK HOLD".

Chapter 5 - Communications

Section 20 - System Description

SATCOM Main Menu Page [Typical]

5.20.4 - Added description of Honeywell SATCOM main menu page.

Directory Page [Typical]

5.20.5 - Added description of Honeywell SATCOM directory page.

Category Numbers Page [Typical]

5.20.6 - Added description of Honeywell SATCOM category numbers page.

SATCOM Main Menu Pages [Typical]

5.20.7 - Added description of Rockwell Collins SATCOM main menu pages.

5.20.8 - Added illustration of Rockwell Collins SAT-2100 SATCOM main menu page 2/2.

5.20.9 - Added Cabin Calls information for Rockwell Collins SAT-2000/2100 SATCOM system.

5.20.9 - Added description of HSDU CONFIG page for Rockwell Collins SAT-2100 SATCOM system.

5.20.9 - Added description of HSDU LOG page for Rockwell Collins SAT-2100 SATCOM system.

SATCOM Directory Page [Typical]

5.20.9 - Added description of Rockwell Collins SATCOM directory page.

SATCOM Directory Display Page [Typical]

5.20.10 - Added description of Rockwell Collins SATCOM directory display page.

Section 40 - MFD Communications Functions

Uplink Message

5.40.16 - Revised nomenclature for ATC Message Block; deleted "Uplink."

5.40.18 - Add paragraph describing display of ATC sidelink messages.

Chapter 7 - Engines, APU

Section 10 - Controls and Indicators

EGT Indications

7.10.9 - Moved Anti-Ice Indications to Chapter 3.

Oil Quantity Indications

7.10.18 - Revised illustration to show low oil quantity black on white for color FCOM, shows white on black for black and white manual.

Compact Engine Indications

7.10.20-21 - Revised illustration to show low oil quantity black on white for color FCOM, shows white on black for black and white manual.

APU Controls

7.10.26 - Added missing closed parenthesis.

Chapter 8 - Fire Protection

Section 10 - Controls and Indicators

APU and Cargo Fire Panel

8.10.3 - Revised system operation: the selection of either cargo fire arming switch shuts down lavatory/galley fans.

Section 30 - EICAS Messages

Airplane System EICAS Messages

8.30.1 - Revised for standardization with QRH.

Chapter 9 - Flight Controls

Section 10 - Controls and Indicators

Normal Flight Control Synoptic

9.10.13 - Revised Flight Control Synoptics to use call out arrows and descriptions for standardization.

Non–Normal Flight Control Synoptic

9.10.15 - Revised Flight Control Synoptics to use call out arrows and descriptions for standardization.

Chapter 10 - Flight Instruments, Displays

Section 10 - Controls and Indicators

PFD Reference Speeds

10.10.5 - Corrected spelling error.

10.10.5 - Revised paragraph for standardization among Boeing models.

EFIS Control Panel ND Controls

10.10.30 - Added weather radar on/off control for clarification.

Section 20 - System Description

Ground Maneuver Camera System

10.20.10 - Removed extra space; no technical change.

Section 40 - Navigation Displays

ND Symbology

10.40.8 - Removed reference to pink for accuracy of colors used on displays.

10.40.8 - Changed "nonactive" to "inactive" for consistency.

10.40.8,10,12,17-18,21,23 - Revised table structure in master document for improved page breaks and table format.

10.40.9 - Revised to list ND modes for consistency.

10.40.11-12 - Separated ADF and VOR rows for simplicity.

10.40.17 - Removed remarks and added sentence referring to chapter 15 for simplicity. Information from the remarks section is already included in chapter 15.

10.40.18 - Moved sentence referring to chapter 11 from inside table to above table for simplicity.

10.40.21,23 - Removed remarks and added sentence referring to chapter 15 for simplicity. Information from the remarks section is already included in chapter 15.

Section 65 - Electronic Flight Bag (EFB)

Display Unit

10.65.2 - Revised callout to reflect system operation.

Video Surveillance (Typical)

10.65.30 - Corrected color of arrow head for standardization; no technical change.

10.65.32 - Removed extra arrow head from callout arrow; no technical change.

Chapter 11 - Flight Management, Navigation

Section 20 - Navigation Systems Description

GPS Data

11.20.1 - Changed, "may" to "should" and "if" to "unless" for consistency with the FCTM.

11.20.1 - Corrected misspelling; accommodate

Section 31 - Flight Management System Operation

Navigation Position

11.31.6 - Revised for clarity.

FMC Position Update

11.31.6 - Revised sentence; TO/GA push FMC position update depends on availability of GPS data, not GPS NAV ON or OFF.

Takeoff and Climb

11.31.19 - Corrected misspelling; Standard.

Section 40 - FMC Preflight

Thrust Limit Page

11.40.40 - Revised for clarity.

Section 41 - FMC Takeoff and Climb

Takeoff

11.41.1 - Added, "LNAV and" for consistency with other Boeing model airplanes.

Section 42 - FMC Cruise

Engine Out Cruise

11.42.19 - Deleted "limitations. Manual entries are allowed." to clarify page description.

Calculated Step Climb

11.42.23 - Paragraph moved from Wind Page.

Reference Navigation Data Page

11.42.31 - Revised Callout for clarity.

11.42.31 - Revised for clarity.

Chapter 13 - Hydraulics

Section 20 - System Description

Hydraulic Systems Schematic

13.20.5 - Revised graphic to show switch nomenclature.

Chapter 15 - Warning Systems

Section 10 - Controls and Indicators

TCAS Controls (EFIS Control Panel)

15.10.7 - Added Traffic (TFC) switch previously omitted.

Section 20 - System Description

Introduction

15.20.1 - Section 15.20 has been restructured to accomodate anticipated or actual installation of the GPWS Runway Awareness and Advisory System (RAAS). These non-technical editorial changes result in some revision bars being displayed on some pages without a respecitive highlight, even though the text or content has not been revised.

Takeoff Configuration Warnings

15.20.11 - Deleted pushing the Master WARNING/CAUTION Reset switch because it is fully described in the section Aurals, Master WARNING/CAUTION Switches and Lights, and GND PROX Light.

Landing Configuration Warning

15.20.11 - Deleted pushing the Master WARNING/CAUTION Reset switch because it is fully described in the section Aurals, Master WARNING/CAUTION Switches and Lights, and GND PROX Light.

Crew Alertness Monitor

15.20.12 - Deleted Crew Alertness Monitor that are defined by the operator and are not tracked by Boeing. Added inhibits previously omitted.

Introduction

15.20.19 - GPWS description resequenced to accomodate anticipated or actual installation of the GPWS Runway Awareness and Advisory System (RAAS).

Altitude Voice Annunciations During Approach

15.20.26 - Non-technical editorial change.

15.20.27 - Minimums voice annunciation installed.

Alerts Inhibited During Takeoff

15.20.31-34 - As part of the restructuring to accomodate GPWS RAAS revision bars are created in this revision only for all Alerts Inhibited During Takeoff tables. The text may be unchanged from previous revisions.

15.20.31 - Added EICAS advisory message TCAS OFF previously included in TCAS Non-Normal Operations description.

Alerts Inhibited During Landing

15.20.34 - GPWS description resequenced to accomodate anticipated or actual installation of the GPWS Runway Awareness and Advisory System (RAAS).

15.20.35 - Added EICAS advisory message TCAS OFF previously included in TCAS Non-Normal Operations description.

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Preface — Chapter 0

V1V2 List of Effective Pages — Section 5

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* SP.TOC.0.1-4	December 14, 2009
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* SP.1.1	December 14, 2009
SP.1.2	December 10, 2007
* SP.2	December 14, 2009

Capt Michael Hoh
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Airworthiness / Flight Operations
17/2/10

* = Revised, Added, or Deleted

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General

The Boeing Company issues Flight Crew Operations Manual Bulletins to provide important information to flight crews prior to the next formal revision of the manual. The transmitted information may be of interest to only specific Operators or may apply to all Operators of this model airplane. Each bulletin will vary.

Bulletins are dated and numbered sequentially. Each bulletin identifies airplanes affected by the bulletin. Absence of airplane effectivity indicates the bulletin applies to all airplanes in an Operator's fleet. When appropriate, the next formal Flight Crew Operations Manual revision will include an updated bulletin record page to reflect current bulletin status.

Bulletin status is defined as follows:

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The person filing a new or revised bulletin should amend the Bulletin Record as instructed in the Administrative Information section of the bulletin. When a bulletin includes replacement pages for the Flight Crew Operations Manual or QRH, the included pages should be filed as instructed in the Flight Crew Operations Manual Information section of the bulletin.

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SIA-00 R63	Operations Manual Bulletin Index	December 14, 2009	IE
SIA-25 R1	HF Radio Anomaly	June 12, 2006	IE
SIA-28 R3	Cabin Pressure Control System Outflow Valve (OFV) Manual Operation	January 28, 2002	IE
SIA-37 R1	Delayed Fuel Flow Indication During Start	December 7, 2001	IE

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SIA-39 R5	STABILIZER GREENBAND Nuisance EICAS Message	June 15, 2009	IE
SIA-41 R2	Electronic Checklist (ECL) Line Items not Completing Correctly	June 30, 2006	IE
SIA-49	777 FMC Calculation of Reduced Thrust Takeoff Anomaly	June 20, 2003	IE
SIA-50	HF Radio Feedback Characteristic	August 4, 2003	IE
SIA-53 R3	Nuisance EICAS Caution Message FMC RUNWAY DISAGREE	August 31, 2006	IE
SIA-56 R2	Fuel Temperature Blanking Indication	August 31, 2006	IE
SIA-59 R2	New Ice Shedding Procedures for Airplanes with Trent 800 Engines in Freezing Fog	September 25, 2006	IE
SIA-60 R1	False Engine-Out Indication	December 10, 2007	IE
SIA-62	FMC Performance Prediction Anomaly	October 17, 2005	IE
SIA-65	Generator OFF Light ON After Engine Start With No EICAS Message	October 13, 2006	IE
SIA-66 R1	Incorrect TAKEOFF REF data following a TAKEOFF REF Uplink	June 15, 2009	IE
SIA-69 R1	FMC Minimum V1, VR, V2 Speed Entry Limits for 777-200LR and 777-300ER Models	June 15, 2009	IE
SIA-70 R1	Honeywell Flight Management Computer Anomaly.	November 12, 2007	IE
SIA-72 R3	Cold Fuel Operations Procedures for RR Trent 800 Series Equipped 777 Airplanes	December 14, 2009	INC
SIA-73	Hand Microphone Use With Flight Deck PC Power Outlets	September 17, 2008	IE
SIA-74	FMC Failure When Programming a "step-down" Descent	December 14, 2009	IE

Number	Subject	Date	Status

Number	Subject	Date	Status

Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-00 R63
Date: December 14, 2009

Document Effectivity: D632W001-SIA

Subject: Operations Manual Bulletin Index

Reason: To provide a listing of Operations Manual Bulletins currently "In Effect" (IE) or "Incorporated" (INC).

The following changes have taken place since index dated June 15, 2009:

Bulletin No.	Status
SIA-00	REVISED
SIA-71	DELETED
SIA-72 R3	REVISED
SIA-74	ADDED

The following bulletins are "In Effect" (IE) or "Incorporated" (INC) and should remain in the Operations Manual:

SIA-25R1	HF Radio Anomaly	2779	June 12, 2006	IE
SIA-28R3	Cabin Pressure Control System Outflow Valve (OFV) Manual Operation	2808	January 28, 2002	IE
SIA-37R1	Delayed Fuel Flow Indication During Start	2949	December 7, 2001	IE
SIA-39R5	STABILIZER GREENBAND Nuisance EICAS Message	2980	June 15, 2009	IE
SIA-41R2	Electronic Checklist (ECL) Line Items not Completing Correctly	2999	June 30, 2006	IE

SIA-49	777 FMC Calculation of Reduced Thrust Takeoff Anomaly	3300	June 20, 2003	IE
SIA-50	HF Radio Feedback Characteristic	3323	August 4, 2003	IE
SIA-53R3	Nuisance EICAS Caution Message FMC RUNWAY DISAGREE	3382	August 31, 2006	IE
SIA-56R2	Fuel Temperature Blanking Indication	3435	August 31, 2006	IE
SIA-59R2	New Ice Shedding Procedure for Airplanes with Trent 800 Engines in Freezing Fog	3475	September 25, 2006	IE
SIA-60R1	False Engine-Out Indication	3531	December 10, 2007	IE
SIA-62	FMC Performance Prediction Anomaly	3622	October 17, 2005	IE
SIA-65	Generator OFF Light ON After Engine Start With No EICAS Message	3724	October 13, 2006	IE
SIA-66 R1	Incorrect TAKEOFF REF data following a TAKEOFF REF Uplink	3727	June 15, 2009	IE
SIA-69 R1	FMC Minimum V1, VR, V2 Speed Entry Limits for 777-200LR and 777-300ER Models	3769	June 15, 2009	IE
SIA-70R1	Honeywell Flight Management Computer Anomaly	3944	November 12, 2007	IE
SIA-72R3	Cold Fuel Operations Procedures for RR Trent 800 Series Equipped 777 Airplanes	4147	December 14, 2009	INC
SIA-73	Hand Microphone Use With Flight Deck PC Power Outlets	4131	September 17, 2008	IE

SIA-74	FMC Failure When Programming a "step-down" Descent		December 14, 2009	IE

Administrative Information

This bulletin replaces bulletin SIA-00 R62 dated June 15, 2009. Discard bulletin SIA-00 R62. Revise the Bulletin Record page to show SIA-00 R62 as "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin SIA-00 R63 "In Effect" (IE).

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplanes P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
Fax:	(206) 662-7812
E-mail	FlightTraining@Boeing.com
SITA:	LKEBO7X

Flight Crew Operations Manual Bulletin for Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-25 R1

IssueDate: June 12, 2006

Subject: HF Radio Anomaly

Reason: To inform flight crews of the subject anomaly and procedure for restoring the HF radio to normal operation.
Added corrective action information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

HF radio systems with Rockwell Collins CPL-920D digital antenna couplers (Part Number 822-0987-002) and analog transceivers may lock up preventing antenna tuning and transmission. The lockup is caused by an interface problem between the transceiver and antenna coupler. The lockup may occur as a result of electrical power interrupts and can be cleared by selecting a new HF frequency, or reselecting the same HF frequency.

Operating Instructions

If there is a lack of side tone when attempting to transmit on an HF frequency, and there is a lack of response to attempted transmissions, push the Frequency Transfer Switch on the Radio Tuning Panel two times.

This action will clear the lockup.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-25 R1 "In Effect" (IE).

This anomaly is corrected with the installation of HF coupler part number 822-0987-003. No Service Bulletin has been issued. This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified with the -003 coupler.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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SITA:	SEABO7X

Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-28 R3

IssueDate: January 28, 2002

Subject: Cabin Pressure Control System Outflow Valve (OFV) Manual Operation

Reason: To provide flight crews with additional information regarding outflow valve manual operation

Revised to include updated Service Bulletin information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Based on two depressurization events, Boeing feels additional information regarding manual mode operations is warranted.

There is a failure mode that can cause an outflow valve to drive in the direction opposite to the command. The incorrect valve movement is detected and stopped in less than one second. However, cycling between auto and manual mode will reset the fault and allow the outflow valve to drive in the wrong direction each time (automatically in auto and when commanded in manual). Repeated resets could drive an outflow valve progressively further open until airplane pressurization could no longer be maintained

Operating Instructions

If the EICAS advisory message OUTFLOW VALVE AFT or OUTFLOW VALVE FWD is displayed follow the non-normal checklist and close the affected outflow valve in manual mode. If the valve moves in the wrong direction, or does not move after six seconds of switch activation, leave the affected valve in manual mode and do not make any further attempt to drive the valve in either direction. Depending on the position of the affected outflow valve, the other outflow valve may not be able to maintain cabin pressurization.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-28 R3 "In Effect" (IE).

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified by PRR 61777-105 (Parts A & B) or Service Bulletin 777–21A0041.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-37 R1

IssueDate: December 7, 2001

Subject: Delayed Fuel Flow Indication During Start

Reason: To inform pilots that there may be a delay of fuel flow indication during start.

Revised to remove attached bulletin record information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of delayed fuel flow indications during engine start. The delay in the fuel flow indication is caused by EEC software and a mechanical resistance problem within the fuel flow meter. Fuel flow indication may be delayed up to 5 seconds after EGT begins to rise.

Operating Instructions

If no fuel flow indication is observed during engine start, do not abort the start unless a starting parameter is exceeded as described in the Engine Start Procedure or Manual Engine Start Procedure.

Administrative Information

This bulletin replaces bulletin SIA-37, dated October 20, 2000. Discard bulletin SIA-37. Revise the Bulletin Record page to show SIA-37 as “Cancelled” (CANC).

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-37 R1 "In Effect" (IE).

This bulletin was previously cancelled with the incorporation of Service Bulletin 777-34-0082. However, bulletin TBC-100 indentifies an anomaly that is corrected with the incorporation of Boeing Alert Service Bulletin SB 777-34A0137. When SB 777-34A0137 is incorporated, the anomaly described in this bulletin applies again. This bulletin is re-issued to cover those cases where SB 777-34A0137 has been incorporated.

This condition is under investigation. This bulletin will be revised to include Service Bulletin information when available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-39 R5

IssueDate: June 15, 2009

Subject: STABILIZER GREENBAND Nuisance EICAS Message

Reason: To inform flight crews of nuisance STAB GREENBAND alerts.

Revised to correct kg values in 3 charts and to remove service bulletin information in the Administrative Information section.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of nuisance STAB GREENBAND advisory alerts on 777 airplanes. These nuisance alerts occur prior to departure (at the gate or during taxi for takeoff) after FMC gross weight (GW) and center of gravity (CG) data are entered which result in a nose down forward greenband stabilizer trim calculation. Dispatch delays have resulted.

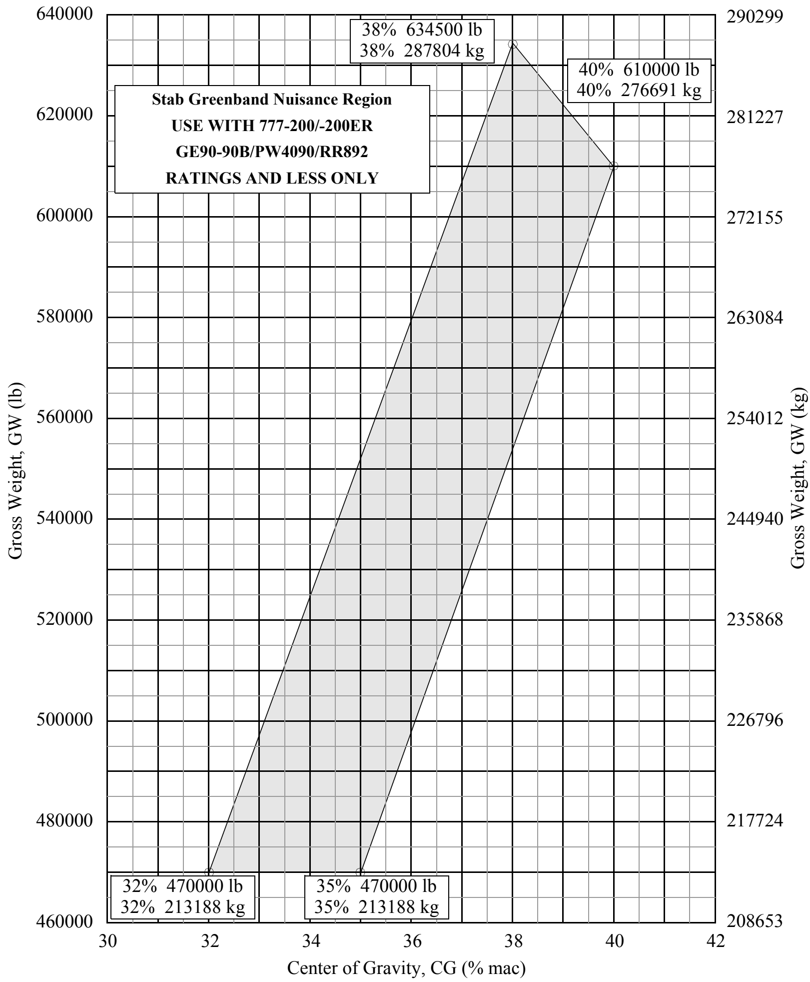
Preliminary investigation indicates that STAB GREENBAND nuisance alerts occur in a small region of the GW and CG envelope where the greenband system has the least margin against nuisance alerts. Boeing has determined that many nuisance messages in the nose down forward greenband can be eliminated by using a fixed and/or assumed temperature derate greater than 15%. Alternatively, the airplane would still be safe to takeoff in this region should the STAB GREENBAND alert be accurate and a real mistrim result. Should a worst case mistrim occur in this range, the column rotation force would be approximately 30-35 pounds. Normal column rotation force is approximately 20-25 pounds.

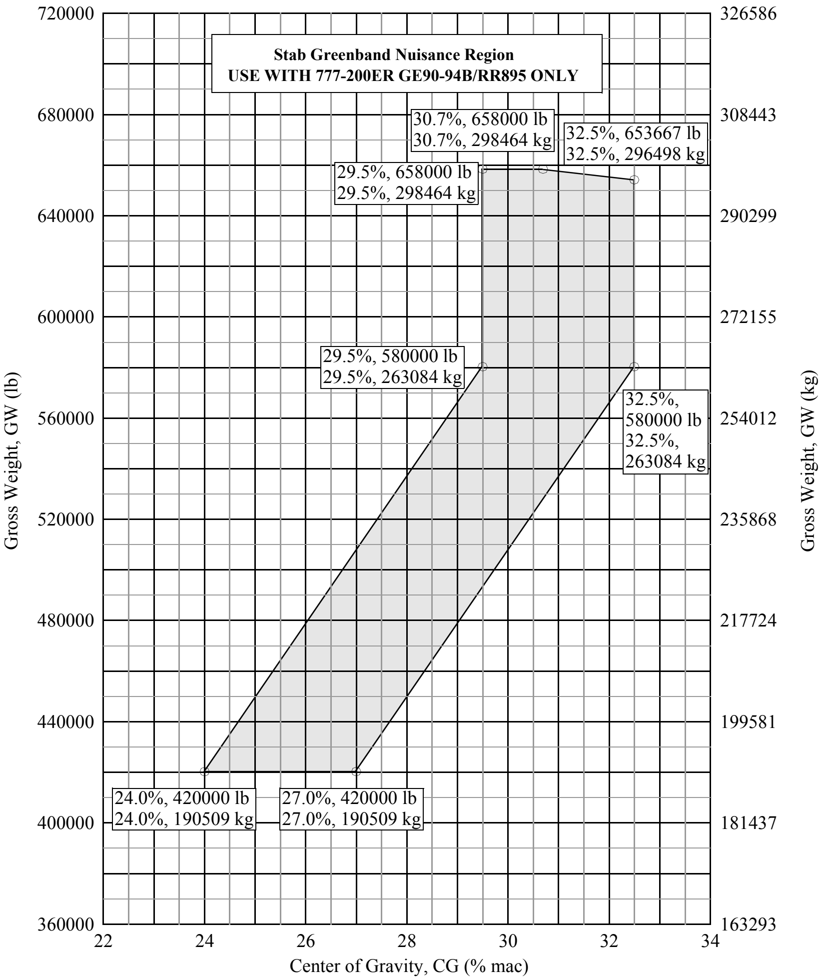
Operating Instructions

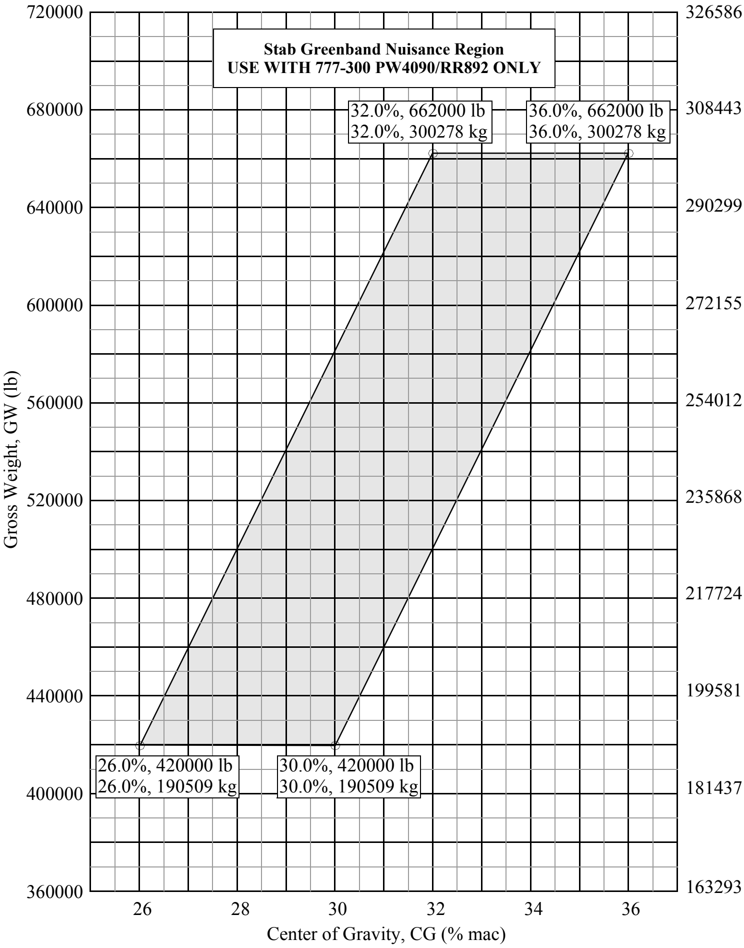
Boeing recommends continued use of the stabilizer greenband monitor and alert. When crews experience a STAB GREENBAND alert after loading is complete:

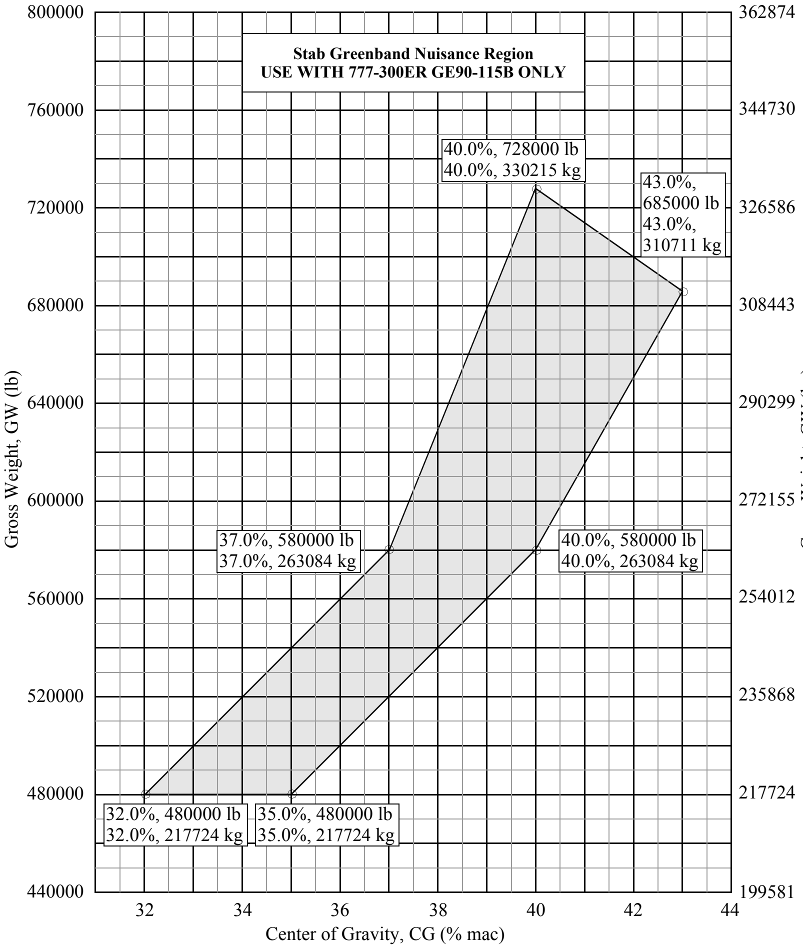
- verify the FMC takeoff data has been correctly entered (takeoff thrust, takeoff flaps, gross weight, and center of gravity)
- verify the stabilizer trim is properly set

If the aircraft GW and CG fall within the Stab Greenband Known Nuisance Region on the following GW-CG charts, the STAB GREENBAND advisory alert may be considered a nuisance and takeoff may be safely conducted. Otherwise, or if in doubt, the alert should be considered valid and the actual loading of the airplane should be verified.




Stab Greenband Nuisance Region
USE WITH 777-200ER GE90-94B/RR895 ONLY
30.7%, 658000 lb
30.7%, 298464 kg
32.5%, 653667 lb
32.5%, 296498 kg
29.5%, 658000 lb
29.5%, 298464 kg
29.5%, 580000 lb
29.5%, 263084 kg
32.5%,
580000 lb
32.5%,
263084 kg
24.0%, 420000 lb
24.0%, 190509 kg
27.0%, 420000 lb
27.0%, 190509 kg
720000
680000
640000
600000
560000
520000
480000
440000
400000
360000
326586
308443
290299
272155
254012
235868
217724
199581
181437
163293
22
24
26
28
30
32
34
Gross Weight, GW (lb)
Gross Weight, GW (kg)
Center of Gravity, CG (% mac)


Stab Greenband Nuisance Region
USE WITH 777-300 PW4090/RR892 ONLY
32.0%, 662000 lb
32.0%, 300278 kg
36.0%, 662000 lb
36.0%, 300278 kg
26.0%, 420000 lb
26.0%, 190509 kg
30.0%, 420000 lb
30.0%, 190509 kg
Gross Weight, GW (lb)
720000
680000
640000
600000
560000
520000
480000
440000
400000
360000
Gross Weight, GW (kg)
326586
308443
290299
272155
254012
235868
217724
199581
181437
163293
26
28
30
32
34
36
Center of Gravity, CG (% mac)



Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-39 R5 "In Effect" (IE).

For airplanes with Nose Gear Pressure Transducers (NGPT), the condition in this bulletin is corrected when SB 777-31-0106 has been incorporated. For airplanes with Nose Gear Pressure Switches (NGPS), the condition in this bulletin is corrected when both SB 777-31-0106 and SB 777-27-0075 have been incorporated. This OMB will be cancelled when Boeing is notified that all airplanes in the customer fleet have the appropriate Service Bulletins incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

Number: SIA-41 R2

IssueDate: June 30, 2006

Subject: Electronic Checklist (ECL) Line Items not Completing Correctly

Reason: o inform flight crews of a problem with ECL line items not completing correctly and appropriate crew response

Added corrective action information

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports from operators of ECL closed loop line items not completing correctly (not changing from white to green) when performing a normal checklist despite the respective switch being selected to the correct position and system operating normally. Boeing engineering has determined that the contacts within the switch which provide switch position to ECL may be intermittent. The affected contacts do not control the system component or function associated with the switch. Switch contact faults can cause ECL line item problems in both normal and non-normal checklists. However, they are most likely when several frequently-used switches must be correctly positioned for the line item to turn green. This occurs with the HYDRAULICS or FUEL items that some operators add to their customized normal checklists. The failure of a switch contact to close or open cannot complete an ECL closed loop line item.

Operating Instructions

If an ECL closed loop line item does not complete as expected, confirm that the switch is positioned correctly. If the system is functioning normally, or is otherwise operating as expected, override the line item and continue with the checklist. The failure of a line item to automatically complete is not indicative of an ECL fault. Therefore, the ECL should continue to be used for all checklists.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-41 R2 "In Effect" (IE).

A vendor design improvement of the push button switches has corrected the problem. Details may be found in Boeing Service Letter 777-SL-31-021. This bulletin will be cancelled when Boeing is notified that the push button switches have been replaced according to the service letter.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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SITA:	SEABO7X

Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-49

IssueDate: June 20, 2003

Subject: 777 FMC Calculation of Reduced Thrust Takeoff Anomaly

Reason: To inform flight crews of a thrust setting anomaly associated with derated thrust takeoff selection.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of anomalous FMC calculation of derate takeoff (TO 1 or TO 2) thrust settings. The percent thrust reduction associated with TO 1 and TO 2 on the FMC THRUST LIM page can display zero (0). This anomaly seems to occur at power up, after a data load, or after FMC reset. When this occurs, selection of TO 1 or TO 2 does not result in derated thrust. The Takeoff EPR/N1 Limit displayed on line 1R of the FMC THRUST LIM page is full rated thrust (TO); however, FMC V speeds may be based on the selected derate. If an assumed temperature has been entered, the resulting thrust reduction is relative to full rated thrust, not the intended derate.

Operating Instructions

Takeoffs using full rated thrust are not affected by this anomaly. If intending to use derates TO 1 or TO 2, verify the appropriate percentage thrust reduction displays under TO 1 or TO 2 on the FMC THRUST LIM page. If the displayed percentage thrust reduction associated with TO 1 and TO 2 is zero (0), FMC selection of derates is not available. Flight crew action should be based on airline policy; however, the following thrust setting options are available:

- Use full rated thrust (TO) with appropriate V speeds, if conditions permit.

- Use the assumed temperature method with full rated thrust (TO) and appropriate V speeds, if conditions permit.
- Set EPR/N1 manually for the intended derate. Derate thrust settings and appropriate V speeds can be obtained from company airport analysis or from the Flight Planning and Performance Manual, Section 1.3.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-49 "In Effect" (IE).

This condition is under investigation. This bulletin remains in effect until further notice.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-50

IssueDate: August 4, 2003

Subject: HF Radio Feedback Characteristic

Reason: To inform flight crews of an audio feedback on the HF radio when using headsets.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has noted, during recent certification and acceptance test flights, an audio feedback tone while transmitting on the HF radios with certain headsets. This tone is noted only when the audio selector panel HF receiver volume is increased to approximately 75% of full volume or higher. This tone does not exist when using the hand microphone nor does it exist while using the oxygen mask microphone.

Operating Instructions

When transmitting on HF with a boom microphone-headset, reducing the HF receiver volume will reduce or eliminate the tones.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-50 "In Effect" (IE).

This condition is under investigation. This bulletin remains in effect until further notice.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-53 R3

IssueDate: August 31, 2006

Subject: Nuisance EICAS Caution Message FMC RUNWAY DISAGREE

Reason: To direct flight crew to disable GPS updating to prevent nuisance display of the EICAS caution message FMC RUNWAY DISAGREE.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Effectivity: All airplanes with optional EICAS caution message FMC RUNWAY DISAGREE message.

The EICAS caution message FMC RUNWAY DISAGREE displays when the airplane position or heading is not within specified limits of the active FMC departure runway and takeoff thrust is applied. GPS updating is required to enable sensing of position errors; heading errors will trigger the message even if GPS updating is disabled.

At certain airports not compliant with WGS-84 standards, the FMC RUNWAY DISAGREE message may display when takeoff thrust is applied and the airplane is on the active FMC departure runway. Under these conditions, the navigation database runway position not compliant with WGS-84 differs from the GPS airplane position enough to trigger display of the message. Disabling GPS updating on the POS REF Page 3/3 (Line Select Key 5R) inhibits the position error sensing to preclude nuisance display of the FMC RUNWAY DISAGREE message. The message will still display if a heading error is detected.

Operating Instructions

Disable GPS updating on the POS REF Page 3/3 before takeoff from airports not compliant with WGS-84. Enable GPS on the POS REF Page 3/3 after takeoff.

Note: Operator will designate affected airports applicable to their operations.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-53 R3 "In Effect" (IE).

This condition exists when the airplane is located in a non-WGS-84 datum. This bulletin will remain in effect until the respective airport facilities are surveyed to the WGS-84 datum.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

Number: SIA-56 R2

IssueDate: August 31, 2006

Subject: Fuel temperature blanking indication.

Reason: To inform flight crews of a Fuel Quantity Processor Unit (FQPU) anomaly that may cause blanking of the fuel temperature indication..

Revised to clarify corrective action information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The fuel temperature indication may blank on certain 777 airplanes, accompanied by the EICAS status message FUEL TEMP INDICATION.

Smiths recently introduced new Fuel Quantity Processor Unit (FQPU) part numbers 0335KPU01 and 0330KPU01 and Boeing incorporated them in production at line positions 423, 429, 466, and 477 and on (refer to Service Letter 777-SL-28-016). The subject problem is associated with the new FQPUs.

Operating Instructions

In the event of inflight blanking of the fuel temperature indication, use Total Air Temperature (TAT) as a conservative indication of fuel temperature.

The FUEL TEMP LOW EICAS advisory message will not display when the fuel temperature indication is blank. Therefore, maintain TAT greater than 3 degrees C above the fuel freeze point.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-56 R2 "In Effect" (IE).

This condition is corrected with FQPU modifications provided in Smiths Aerospace Service Bulletin 0330KPU01-28-0437 or 0335KPU01-28-438, depending on the installed FQPU part number. This bulletin will be cancelled when Boeing is notified all affected airplanes in the customer fleet are modified by appropriate Smiths Aerospace service bulletin.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-59 R2

IssueDate: September 25, 2006

Subject: New Ice Shedding Procedures for Airplanes with Trent 800 Engines in Freezing Fog

Reason: To inform flight crews of the need to use special ice shedding procedures in freezing fog conditions.

Revised Background Information and Operating Instructions.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

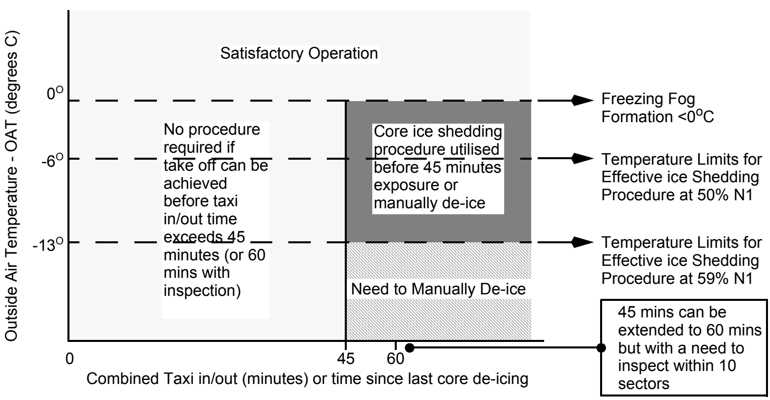
THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of engine surges and internal damage on Trent 700 powered A330 airplanes. This damage was experienced following extended idle thrust operation in freezing fog. In freezing fog conditions, ice can build up in the core of the engine in addition to on the fan. Since the Trent 700 is very similar in design to the Trent 800 on the 777, Boeing and Rolls Royce have determined that a similar situation may occur with the Trent 800. Analysis shows the current Trent 800 ground engine ice shedding procedure, which requires momentary operation at 50% N1 every 60 minutes, is adequate for shedding fan ice accumulations but may not always shed core ice accumulations in freezing fog conditions. Analysis has also shown that extended exposure to freezing fog conditions below -13 degrees C may create ice accumulations that are impractical or impossible to shed using ground run-up procedures. Use of engine anti-ice on the ground will not prevent ice accumulations on the fan or in the core of the engine. An engine which experiences freezing fog on taxi in to the gate will not shed this ice while the engine is shut down in cold temperatures. For this reason, the total time of taxi in and taxi out in freezing fog must be considered.

This procedure is applicable whenever freezing fog with visibility 300 meters or less is reported. This procedure does not apply to operations in snow, hail, sleet, freezing rain, or freezing drizzle. These conditions have a larger water particle size that does not cause core icing. Boeing and Rolls Royce recommend accomplishing the new ice shedding procedure anytime total taxi time exceeds 45 minutes in the above freezing fog/visibility conditions. However, several customers have requested to be able to takeoff after up to 60 minutes of total taxi time without accomplishing the core ice shedding procedure. This is permitted, but the flight crew must make a log book entry of the number of total minutes of taxiing in freezing fog with visibility 300 meters or less. An engine borescope is required within ten flights. In all cases, accomplish the existing Engine Anti-Ice Use Supplemenary Procedure prior to brake release for takeoff when the conditions in the procedure are applicable.

The ice shedding procedure in freezing fog conditions is summarized in the following table:



Core Ice Shedding Procedure

Operating Instructions

Flight crews are to use the following core ice shed procedures for Trent 800 engines when freezing fog with visibility 300 meters or less is reported.

If takeoff can be achieved within 45 minutes total taxi time, accomplish the existing Engine Anti-Ice Operation - On the Ground Supplementary Procedures prior to brake release for takeoff. The core ice shed procedure is not required.

If takeoff cannot be achieved within 45 minutes total taxi time, accomplish the following core ice shed procedure within 45 minutes total taxi time to clear the core ice from the engine. Accomplish the following core ice shed procedure at subsequent intervals no greater than every 45 minutes prior to takeoff.

If OAT is 0 degrees C to -6 degrees C, run-up the engines to 50% N1 for 60 seconds every 45 minutes.

If OAT is -7 degrees C to -13 degrees C, run-up the engines to 59% N1 for 60 seconds every 45 minutes.

Note: Setting run-up thrust at 59% N1 is recommended as the Takeoff Configuration Warning may be annunciated at 60% N1.

CAUTION: Precautions must be taken for:

- Jet blast up to 900 feet (300 meters) behind the aircraft.
- Snow and ice at the edge of the taxi way that can be ingested by the engines.
- Slippery taxi surfaces.
- Airport noise restrictions.
- If OAT is less than -13 degrees C, there is no effective run-up procedure and manual de-icing is required.

Regardless of temperature, if the core ice shedding procedure described above is not accomplished within 45 minutes total taxi time in freezing fog, but takeoff can be achieved within 60 minutes total taxi time in freezing fog, takeoff is permitted. A borescope inspection will be required within 10 flights. A note must be made in the log book of this condition.

Take off is not permitted if total taxi time in freezing fog with visibility 300 meters or less exceeds 60 minutes without having accomplished the above core ice shed procedure. The engine core must be manually de-iced.

Note: Crews must include taxi-in time from the previous flight if taxi-in occurred in freezing fog with visibility 300 meters or less and the temperature remains below freezing. The engine may be considered free of ice prior to engine start if:

- manually de-iced,
- visually inspected per the AMM, or
- the above core ice shed run-up procedure is conducted within 5 minutes before engine shutdown during taxi-in.

If the engine is considered free of ice prior to engine start, use only the total taxi-out time.

To avoid manual de-icing requirements, operators are encouraged to work with airport authorities to limit or eliminate exposure to extended taxi times when freezing fog conditions exist.

In all cases, accomplish the Engine Anti-Ice Use Supplemenary Procedure, prior to brake release for takeoff when the conditions in the procedure are applicable.

This bulletin has been coordinated with Rolls Royce.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-59 R2 "In Effect" (IE).

This bulletin will be incorporated in a future revision to the 777 FCOM for Trent 800 engines only.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplane Group P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
Fax:	(206) 662-7812
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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-60 R1

IssueDate: December 10, 2007

Subject: False Engine-Out Indication

Reason: To inform pilots of a Loss of N3 Indication (Dedicated Generator) anomaly on Rolls-Royce engines.

Revised Administration Information section to incorporate corrective service bulletin information.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported in-service events in which the N3 Engine Display arc blanks and the digital N3 displays "0.0." No EICAS alert level messages are present, but several status level messages may result (ENG CONTROL, ENG EEC C1, ENG OPU and ENG TURB OVSP SYS, for example).

This condition is caused by a failure within the engine Dedicated Generator. The Dedicated Generator (DG) is a small generator on the engine gearbox which powers various engine components and provides the N3 signal to the EEC and airplane.

During a recent DG failure, the engine continued to provide normal thrust response. However, the FMC and Autopilot interpreted the N3 signal loss as an engine-out condition. When this condition exists, the Autothrottle may command slow thrust fluctuations to accommodate the false engine-out condition when above approximately FL200. These thrust fluctuations can cause the airspeed to vary between EO Speed and a protective margin below VMO/MMO. At lower altitudes or during climbs and descents at any altitude, autothrottle operation is normal. Additionally, the Autopilot may add a rudder input during LAND 2 / LAND 3 operations. However, because the engines are still operating normally and thrust is symmetrical, the rudder is compensated by aileron input and a slight "cross control" condition may occur when LAND 2 / LAND 3 is annunciated.

FMC performance predictions will approximate the all-engine performance. However, the FMC's CALCULATED fuel value on the PROGRESS 2/x page will lag the TOTALIZER until the FUEL DISAGREE EICAS message (AIMS BLOCK POINT 05) or the FUEL DISAGREE - PROG 2/3 CDU scratchpad message (AIMS BLOCK POINT 03 and earlier) is displayed. Selection of the TOTALIZER will ensure that fuel and ETA predictions reflect the all-engine configuration.

Additionally, the loss of N3 following a DG failure will inhibit an in-flight engine start should the respective engine fail. Crews should be aware that the combined probability of loss of N3 due to a DG failure and an engine failure is extremely remote.

Boeing and Rolls Royce are investigating an improved Dedicated Generator to resolve this issue.

Operating Instructions

If one of the N3 Engine Display arcs blank and the respective digital N3 value displays "0.0," but all other engine indications are normal:

1. Operations above approximately FL200: Climbs and descents are not affected. During cruise, disconnect the autothrottle and set power for the desired speed or Mach.

2. Approach to an Autoland (LAND 2 / LAND 3): The 777 Autopilot has been demonstrated to safely land and rollout with an engine out. Therefore, should an autoland be required and this false engine-out condition exists, continue the approach and landing. Manual landings are not affected.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-60 R1 "In Effect" (IE).

An interim software update to improve the EEC response to this anomaly will be available in December 2005. However, the airplane level effects described in this bulletin will continue until new Dedicated Generator hardware is available.

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified by vendor (RR) Service Bulletin RB.211-72-E845.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplane Group P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
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SITA:	SEABO7X

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Flight Crew Operations Manual Bulletin for Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-62

IssueDate: October 17, 2005

Subject: FMC Performance Predictions Anomaly

Reason: To inform flight crews of an FMC performance prediction anomaly following ABEAM PTS selection.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported erroneous FMC performance predictions following execution of the ABEAM PTS function on the LEGS page. When OAT values have been previously entered in LSK 5R on the WIND page, and the ABEAM PTS feature is then selected following a "direct-to" flight plan modification, the OAT value on the WIND page erroneously changes to "0" degrees. Subsequently, the fuel predictions are erroneously calculated based upon 0 degrees instead of the previously entered value for the respective cruise altitude. Operators have reported display of INSUFFICIENT FUEL FMC alert messages and fuel predictions much lower than planned. Additionally, there are no flight deck annunciations or alerts to the crew to indicate the OAT value on the WIND page has changed.

Operating Instructions

Following selection of the ABEAM PTS feature, review the ALT/OAT value on the respective WIND page. Re-enter the correct altitude and the indicated SAT (from PROGRESS page 2) on the ALT/OAT line for the next waypoint, if required. This data will propagate to all down track waypoints. Following reentry of OAT, FMC fuel predictions should be near those on the flight plan.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-62 "In Effect" (IE).

This condition is temporary until the system is modified. This bulletin remains in effect until further notice.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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SITA:	SEABO7X

Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company **Seattle, Washington 98124-2207**	777

Number: SIA-65

IssueDate: October 13, 2006

Subject: Generator OFF Light ON After Engine Start With No EICAS Message

Reason: To inform flight crews of potential generator off line with no alert message.

> Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

In normal operation, if a main generator drops off line for any reason, the associated generator OFF light illuminates, and an EICAS Advisory message ELEC GEN OFF L, R is shown.

During an engine start if a generator does not reach a minimum frequency of 380 Hz the generator will not come on line and the generator OFF light will remain illuminated. However, the ELEC GEN OFF L, R EICAS message may not show. This lack of an EICAS message is known to have occurred on two or more occasions during engine starts only.

The Generator Control Unit supplier, Hamilton Sundstrand, is studying the feasibility of incorporating a change which will assure the ELEC GEN OFF L, R message is displayed on EICAS if the generator fails to come on line during engine start.

Operating Instructions

After engine start, flight crews should check that the generator OFF lights on the electrical panel are not illuminated. If a generator OFF light is illuminated, maintenance action is required.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-65 "In Effect" (IE).

This condition is temporary until the system is modified. This bulletin will be revised when service bulletin information is available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-66 R1

IssueDate: June 15, 2009

Subject: Incorrect TAKEOFF REF data following a TAKEOFF REF Uplink.

Reason: To inform pilots of an FMC Takeoff Datalink anomaly.

To revise the Administrative Information section to provide information on how this condition can be corrected, thus allowing this bulletin to be cancelled.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

An operator reported events where old TAKEOFF REF page data (THRUST, RW, Vspeeds, etc.) appeared on the TAKEOFF REF page 1 following an updated TAKEOFF REF uplink just prior to takeoff. In each event, the flight crew reported that the incorrect data appeared to be from the previous leg. Boeing has replicated the behavior and discovered a software anomaly that allows old TAKEOFF REF uplinks to remain in memory between flights. When this anomaly occurs, the old data appears on the TAKEOFF REF page following a TAKEOFF REF uplink that contains only partial takeoff data (CG for example).

Operating Instructions

Do not accept partial TAKEOFF REF page uplinks (only an updated GC, for example) unless you have previously received and accepted a complete TAKEOFF REF page (all data fields contain data) for the intended flight leg. If a partial uplink is received and any fields on the TAKEOFF REF page are blank, dashes, or boxes, reject the uplink and select the REQUEST prompt on the TAKEOFF REF page to get a complete TAKEOFF REF uplink or enter the TAKEOFF REF data manually.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-66 R1 "In Effect" (IE).

This condition is corrected with the installation of AIMS BPV14 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0149.
- AIMS-2 hardware airplanes - SB 777-31A0150.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplane Group P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
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SITA:	SEABO7X

Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-69 R1

IssueDate: June 15, 2009

Subject: FMC Minimum V1, VR, V2 Speed Entry Limits for 777-200LR and 777-300ER Models

Reason: To inform flight crews of reduced FMC capability to detect erroneous manual and uplinked V1, VR and V2 entries.

To revise the Administrative Information section to provide information on how this condition can be corrected, thus allowing this bulletin to be cancelled.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This condition exists only on the 777-200LR and 777-300ER airplanes.

An AIMS OPC option is enabled for all 777-200LR and 777-300ER models which results in the deactivation of minimum value checking for uplinked or manually entered V1, VR and V2 speeds. Flight crews are advised that the FMC will accept uplinked or manually entered V-speeds as low as 80 knots. "MINV1", "MINVR", and "MINV2" do not display in the associated header lines, and the value of MINV1, MINVR, and MINV2 do not display in the data lines on the TAKEOFF REF page.

Operating Instructions

Flight crews should ensure that manually entered V speeds are entered correctly on the TAKEOFF REF page of the CDU.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-69 R1 "In Effect" (IE).

This condition exists in 777-200LR and 777-300ER airplanes that do not have AIMS BPV14 software installed. This condition is corrected with the installation of AIMS BPV14 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0149.
- AIMS-2 hardware airplanes - SB 777-31A0150.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplane Group P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-70 R1

IssueDate: November 12, 2007

Subject: Honeywell Flight Management Computer Anomaly

Reason: To inform flight crews of a Honeywell FMC anomaly that incorrectly deletes a speed constraint. Revised to reflect AT-OR-BELOW is not a factor in this anomaly.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has confirmed operator reports of a Honeywell FMC anomaly that incorrectly deletes a speed constraint. Some SIDs are designed to limit turn radius to maintain clearance with other traffic or restricted airspace. Some of these procedures also have an AT-OR-ABOVE altitude restriction in conjunction with the speed constraint. Typically, the airplane will be required to limit speed until passing the respective waypoint as well as climb above the altitude constraint. In these procedures, VNAV will incorrectly delete the speed constraint prior to reaching the waypoint if the altitude constraint has been satisfied. When this happens, VNAV will command speed to accelerate to ECON speed (or SEL speed) prior to reaching the constrained waypoint. This anomaly exists on all Boeing 747 / 757 / 767 / 777 airplanes equipped with the Honeywell FMC.

Honeywell is aware of this anomaly and has planned changes for the 777.

Operating Instructions

To prevent exceeding a speed restriction when accompanied by an AT-OR-ABOVE altitude constraint, use speed intervention (enter speed constraint in the MCP Speed Window) until the constrained waypoint is sequenced. After passing the waypoint, select VNAV as desired.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-70 R1 "In Effect" (IE).

This bulletin will be incorporated in a future revision of your Flight Crew Operations Manual.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company **Seattle, Washington 98124-2207**	**777**

Number: SIA-72 R3

IssueDate: December 14, 2009

Subject: Cold Fuel Operations Procedures for RR Trent 800 Series Equipped 777 Airplanes

Reason: To inform flight crews of new procedures to prevent, or address, the loss of thrust response or thrust rollback when operating with cold fuel.

As the result of a recent thrust rollback incident on a second RR Trent 800-powered 777-200ER, revision 2 of this bulletin revises the condition statement on the Engine Response non-normal checklist and also revises the Cold Fuel Operations supplementary procedure. In addition, the Background Information and Operating Instructions of the bulletin have been updated.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Investigations into an accident involving a RR Trent 800-powered 777-200ER and a subsequent thrust rollback incident involving another RR Trent 800-powered 777-200ER have identified the potential for a restriction in fuel flow under certain conditions, resulting in thrust rollback and failure to achieve a commanded thrust. The restriction can be caused by ice building up within the fuel supply system, then breaking free and collecting downstream at the engine Fuel Oil Heat Exchanger (FOHE). It must be emphasized that the investigations are still on-going, but knowledge gained to date has led to the development of procedures to address this potential condition.

Water is present in jet fuel and is uploaded into the aircraft during each refueling. The airplane's water scavenge system and periodic sumping can prevent excessive water build-up within the tanks. However, these measures cannot remove all water present in the tanks. Since water is always present in jet fuel, ice will form as the fuel temperature cools below 0 degrees C. The unusual circumstances of the accident flight include burning from the main wing tanks for an extremely long period of time at low fuel temperatures and at lower than average fuel flows, stretching back into the previous flight, with the fuel temperature remaining below 0 degrees C after fueling.

During the accident flight, the fuel temperature reached a low of -34 degrees C during cruise, and warmed to only -22 degrees C on approach, both of which are unusually cold for the 777 fleet. Step climbs were conducted using lower power settings for passenger comfort. Laboratory testing has shown that ice can accumulate within the tank and fuel system at cruise power settings. Over many hours at low power settings, it is believed that ice accumulation can reach a significant amount. Periodic high fuel flows, such as used in VNAV step climbs, help keep the system clear of large amounts of ice

Laboratory testing has shown that the FOHE will effectively melt typical amounts of ice that travel downstream from the fuel supply system. If too much ice arrives at one time, a partial blockage can occur. The amount of restriction will vary depending on the amount of ice, but the fuel flow always remains higher than idle and engine flameout will not occur. Depending upon the amount of ice, the restriction may go away on its own.

However, laboratory testing has also shown that reducing the fuel flow to min idle fuel flow will always clear any amount of ice at the FOHE within a few seconds. This reduction in fuel flow reduces the amount of cold fuel entering the FOHE, allowing the hot oil to quickly melt the ice. Full thrust capability is then completely restored. Testing has also shown that the FOHE is not susceptible to ice restriction if the fuel temperature is -10 degrees C or warmer.

During the subsequent thrust rollback incident, the thrust rolled back to a level above idle on only one engine during level cruise flight at FL 390, approximately 40 minutes after a VNAV step climb. The indicated EPR dropped below the commanded level, causing a large command EPR sector to appear on the EPR indicator of the affected engine. The flight crew performed the Engine Response non-normal checklist, which cleared the restriction and restored full capability to the engine for the remainder of the flight. The other engine operated normally throughout the flight.

Reviewing over 1.2 million flights of this airplane model/engine type did not reveal any other instance where the thrust rolled back during cruise or after a step climb in this manner.

Data from the flight data recorder of the thrust rollback aircraft shows that two VNAV step climbs occurred, one 55 minutes prior to the rollback and another one 15 minutes later (40 minutes before the rollback). It is suspected that ice was released within the fuel system during the first step climb, traveled downstream and formed a restriction at the face of the FOHE of the affected engine. While the restriction was not large enough to cause an immediate rollback, the oil temperature rose uncharacteristically on that engine. The second step climb was successfully completed in this condition 15 minutes later, 40 minutes before the restriction caused the thrust to roll back.

The flight profile of the thrust rollback aircraft was quite different from the flight profile of the accident aircraft. While the flight of the thrust rollback aircraft was long range and colder than average, it was not as cold as that experienced with the accident aircraft. The fuel temperature encountered by the thrust rollback aircraft was not exceptionally low, reaching a minimum of -22 deg. C, which occurred during cruise around the time of the rollback. In addition, the fuel temperature at takeoff was above 0 deg. C, precluding the need to accomplish the fuel recirculation procedure. Also, the step climbs of the two aircraft were performed differently. The step climbs of the thrust rollback aircraft were performed using VNAV while the accident aircraft step climbs were performed at lower thrust settings for passenger comfort.

Operating Instructions

The circumstances that differentiate the accident flight from millions of other flights led to the previously attached (but now incorporated) conservative Cold Fuel Operations supplementary procedure and the Engine Response non-normal checklist. The goal of these procedures is to assure continued safe operation of RR Trent 800-powered 777s by preventing a long term accumulation of ice beyond the level manageable by the FOHE.

The circumstances of the thrust rollback flight has caused the Cold Fuel Operations supplementary procedure and the Engine Response non-normal procedure to be revised (see attachments). The attached Cold Fuel Operations supplementary procedure should now be accomplished within 2 hours (revised from 3 hours) of top of descent when fuel temperature is colder than -10 degrees C; and the Engine Response non-normal procedure (non-normal checklist) should be accomplished if the engine(s) did not reach commanded thrust or rolls back, and fuel system icing is suspected (indicated EPR is below commanded EPR and fuel temp is below -10 degrees C).

Perform all step climbs using VNAV or maximum climb thrust.

During initial descent, maintain idle thrust for a minimum of 30 seconds.

The appearance of a command EPR sector (when actual EPR is less than commanded EPR), as experienced in the thrust rollback incident, is a symptom that can be used to differentiate between a cold fuel icing rollback from a type of rollback where the command EPR also rolls back with the actual EPR, such as occurs with P20 probe icing.

As with the previous release of this bulletin, these revised procedures are not required if fuel temperature is -10 degrees C or warmer.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-72 R3 "Incorporated" (INC).

This bulletin will be incorporated in the June 15, 2009 revision of the Flight Crew Operations Manual. The affected LEP, index and table of contents pages will be updated at that time. This bulletin will be cancelled when Boeing is notified that service bulletin 777-72A0030 has been incorporated into the customer’s fleet.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

777

Number: SIA-73

IssueDate: September 17, 2008

Subject: Hand Microphone Use With Flight Deck PC Power Outlets

Reason: To inform flight crews of a new restriction on using the flight deck PC power outlets when the hand microphone is used.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received customer complaints of interference when using hand held microphones both on the ground and in flight. Investigation has shown interference may be caused by items plugged into the PC power outlets on the flight deck. Any item plugged into a PC power outlet, whether turned on or not, can cause interference. AC 91-21.1B prohibits the use of items that cause interference with communications.

Boeing is issuing placards that state: “WHEN USING HAND MIC REMOVE PWR CORD FROM OUTLETS”.

Operating Instructions

Remove any power cords from all flight deck PC power outlets before using a hand microphone.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin SIA-73 "In Effect" (IE).

This condition is temporary until the system is modified. This Operations Manual Bulletin will be cancelled after Boeing is notified all affected airplanes in your fleet have been modified by Service Bulletin (TBD).

This bulletin will be revised to include Service Bulletin information when it becomes available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address:	Manager, Flight Training and Technical Data 777 Model Boeing Commercial Airplane Group P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
Fax:	(206) 662-7812
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Flight Crew Operations Manual Bulletin
for
Singapore Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

Number: SIA-74

IssueDate: December 14, 2009

Subject: FMC Failure When Programming a "step-down" Descent.

Reason: To inform flight crews of an FMC anomaly.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported dual FMC failures when a "planned step" to a lower than current cruise altitude is entered and executed on the LEGS page. Frequently, the "planned step down" entry was followed by route changes executed on the RTE page. Boeing has confirmed that when a LEGS page entry such as "/FL230S" is executed, and that altitude is below the current cruise altitude displayed on the ACT CRZ page, both FMCs may momentarily reset to resolve the planned "step down" in the flight plan route.

Operating Instructions

Do not enter a planned step altitude (in the format FLxxxS) that is below the current cruise altitude. When a descent is required to a new cruise altitude, enter a new cruise altitude in line 1L on the CRZ page and perform a cruise descent.

Administrative Information

Insert this bulletin behind the Flight Crew Operations Manual Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin SIA-74 "In Effect" (IE).

This anomaly will be corrected in the next AIMS software revision (AIMS updates after BP V14) with FMC update. This bulletin will be revised to incorporate the appropriate service bulletin information that corrects this anomaly at the time that information becomes available.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address:	Boeing Commercial Airplanes Commercial Aviation Services Attn: 777 Manager, Flight Technical Data P.O. Box 3707 M/C 20-89 Seattle, WA 98124-2207 USA
email:	flighttraining@boeing.com
Telephone:	(206) 662-4000
Fax:	(206) 662-4743

Service Bulletin Coverage

Data supporting service bulletins requiring mandatory installation are automatically incorporated in the FCOM. Optional service bulletins are covered in the manual both with and without the service bulletin incorporation configurations.

The dual condition coverage continues until such time that the customer advises the Senior Manager of Flight Training & Technical Data of the status of the airplane modification. Upon notification by the customer, the operations manual is modified to remove unnecessary information.

If the customer has not informed the Senior Manager of Flight Training & Technical Data of the incorporation or rejection of an optional service bulletin within two years of the issue of the last revision to the service bulletin, the manual is automatically modified to reflect the most conservative approach of the service bulletin situation.

When content is affected by a service bulletin, a paragraph heading states the bulletin effectivity for the paragraph. When a condition exists where some airplanes have been modified with and without the service bulletin, additional paragraphs with headings designating the effectivity for each paragraph appear in sequence to provide correct data for the airplanes without the service bulletin incorporated.

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Limitations — Chapter L
Table of Contents — Section 0

General

This chapter contains Airplane Flight Manual (AFM) limitations and Boeing recommended non-AFM operating limitations. Limitations that are obvious, shown on displays or placards, or incorporated within an operating procedure are not contained in this chapter.

Airplane General

Operational Limitations

Runway slope	+/- 2%
Maximum Takeoff and Landing Tailwind Component	15 knots
Maximum Operating Altitude	43,100 feet pressure altitude
Maximum Takeoff and Landing Altitude	8,400 feet pressure altitude

Non–AFM Operational Information

The turbulent air penetration speed (in severe turbulence) is defined as: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above. Maintain a minimum speed of 15 knots above the minimum maneuvering speed at all altitudes when airspeed is below 0.82 Mach.

The maximum demonstrated takeoff and landing crosswind is 38 knots.

Do not operate HF radios during refueling operations.

Do not operate the weather radar in a hangar or within 50 feet (15.25 meters) of any personnel or a fuel spill.

Note: The hangar and personnel restrictions do not apply to the weather radar test mode.

RVSM Operations

Non-AFM Operational Information

Prior to takeoff the maximum allowable difference between Captain's or First Officer's altitude display and field elevation is 75 feet.

The standby altimeter does not meet altimeter accuracy requirements of RVSM airspace.

Weight Limitations

9V-SQA - 9V-SQN, 9V-SRB - 9V-SRQ
(SB Deletes 9V-SRA ; before SB. Modification to operate at higher taxi and takeoff weights not installed.)

Weights	Kilograms
Maximum Taxi Weight	252,650
Maximum Takeoff Weight	251,743
Maximum Landing Weight	208,652
Maximum Zero Fuel Weight	195,044

9V-SVA - 9V-SVO
(SB Adds 9V-SRA ; after SB. SB installs modification to operate at increased taxi and takeoff weights.)

Weights	Kilograms
Maximum Taxi Weight	295,742
Maximum Takeoff Weight	294,835
Maximum Landing Weight	208,652
Maximum Zero Fuel Weight	195,044

9V-SWA - 9V-SWT

Weights	Kilograms
Maximum Taxi Weight	352,441
Maximum Takeoff Weight	351,534
Maximum Landing Weight	251,290
Maximum Zero Fuel Weight	237,682

9V-SYA - 9V-SYL

Weights	Kilograms
Maximum Taxi Weight	300,278
Maximum Takeoff Weight	299,370
Maximum Landing Weight	237,682
Maximum Zero Fuel Weight	224,528

Door Mounted Power Assists and Escape Slides

Main door emergency power assists and evacuation slide systems must be armed with the mode select handle in the ARMED position prior to taxi, takeoff and landing whenever passengers are carried.

Flight Deck Security Door

Verify that an operational check of the Flight Deck Access System has been accomplished according to approved procedures once each flight day.

Lower Crew Rest Compartment

9V-SVA - 9V-SVO

The lower crew rest compartment may not be occupied, and the main entry hatch must be closed during taxi, takeoff, or landing.

Air Systems

Cabin Pressurization

Maximum differential pressure (relief valves)	9.1 psi
Maximum allowable cabin pressure differential for takeoff and landing	0.11 psi

Autoflight

Autopilot/Flight Director System

The autopilot must not be engaged below a minimum engage altitude of 200 feet AGL after takeoff.

The autopilot must be disengaged before the airplane descends more than 50 feet below the MDA unless it is coupled to an ILS glideslope and localizer or in the go–around mode.

Without LAND 2 or LAND 3 annunciated, the autopilot must be disengaged below 200 feet AGL.

Automatic Landing

When landing weather minima are predicated on autoland operations the following limits apply:

Maximum Allowable Wind Speeds	
Headwind	25 knots
Tailwind	15 knots
Crosswind	25 knots

The maximum glideslope angle is 3.25 degrees.

The minimum glideslope angle is 2.5 degrees.

Automatic landings can be made using flaps 20 or 30, with both engines operative or one engine inoperative. The autopilot flight director system (AFDS) autoland status annunciation must display LAND 2 or LAND 3.

Communications

Flight Deck Communications Systems (Datalink)

The datalink from the COMPANY format is limited to the transmission and receipt of messages, which will not create an unsafe condition if the message is improperly received, such as the following conditions:

- the message or parts of the message are delayed or not received,
- the message is delivered to the wrong recipient, or
- the message content may be frequently corrupted.

However, Pre-Departure Clearance, Digital Automatic Terminal Information Service, Oceanic Clearances, Weight & Balance, and Takeoff Data messages can be transmitted and received via the COMPANY format if they are verified per approved operational procedures.

HF Communication System

9V-SQA - 9V-SQD, 9V-SYA - 9V-SYD

If one HF radio is selected for transmission, deselect the other HF radio on all audio control panels to prevent audio interference.

Engines

Engine Limit Display Markings

Maximum and minimum limits are red.

Caution limits are amber.

Engine Oil System

9V-SQA - 9V-SVO, 9V-SYA - 9V-SYL

Oil temperature must be greater than -40 degrees C for engine start and 50 degrees C before advancing thrust levers to takeoff power.

Engine Fuel System

The maximum tank fuel temperature is 49 degrees C.

9V-SQA - 9V-SVO, 9V-SYA - 9V-SYL
After refueling and prior to takeoff, if fuel temperature is 0 degrees C or colder or if fuel temperature indication is inoperative, verify the approved fuel circulation procedure was performed.

Tank fuel temperature prior to takeoff must not be less than -40 degrees C or 3 degrees C above the fuel freezing point, whichever is higher. In-flight tank fuel temperature must be maintained at least 3 degrees C above the freezing point of the fuel being used. The use of Fuel System Icing Inhibitor additives does not change the minimum fuel tank temperature limit.

Reverse Thrust

Intentional selection of reverse thrust in flight is prohibited.

Backing the airplane with use of reverse thrust is prohibited.

Non-AFM Operational Information

9V-SWA - 9V-SWT

For ground operation (exclusive of takeoff) in tailwinds and crosswinds between 30 and 45 knots, engine power should be limited to a maximum of 70% N1. Avoid thrust levels above that required for normal taxi operation in all tailwinds and crosswinds greater than 45 knots.

Airplane Structure

Flight Controls

Avoid rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw (e.g. large side slip angles) as they may result in structural failure at any speed, including below V_A.

Non-AFM Operational Information

Ground wind limits for all doors:

- 40 knots while opening or closing
- 65 knots while open.

Flight Instruments, Displays

Ground Maneuver Camera System

9V-SWA - 9V-SYL

The ground maneuver cameras should not be used during takeoff, approach, and landing.

Electronic Flight Bag (EFB)

9V-SWA - 9V-SWT
(SB Adds 9V-SQA - 9V-SVO, 9V-SYA - 9V-SYL ; after SB. SB installs Electronic Flight Bag.)

The EFB portable keyboard and attaching cable must be stowed during takeoff and landing.

Flight Management, Navigation

ADIRU

ADIRU alignment must not be attempted at latitudes greater than 78 degrees, 14.75 minutes.

QFE Selection

A QFE altitude reference for the primary flight displays must be selected in the flight management system whenever QFE is used instead of QNH.

Fuel System

Main tanks must be scheduled to be full if center tank fuel is loaded.

Note: The center tank may contain up to 1360 kilograms of fuel with less than full main tanks provided center tank fuel weight plus actual zero fuel weight does not exceed the maximum zero fuel weight, and center of gravity limits are observed.

Warning Systems

GPWS - Look-Ahead Terrain Alerting

Do not use the terrain display for navigation.

The use of look-ahead terrain alerting and terrain display functions is prohibited within 15 NM of takeoff, approach or landing at an airport or runway not contained in the GPWS terrain database. Refer to Honeywell Document 060-4267-000 for airports and runways contained in the installed GPWS database.

TCAS

Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with a TCAS II resolution advisory.

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Performance Dispatch — Chapter PD

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Performance Dispatch — Chapter PD

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777-200ER TRENT884 KG FAA

Performance Dispatch — Chapter PD
Takeoff — Section 10

Takeoff Field Corrections
Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1240	1230	1220	1210	1200	1180	1160	1140	1120
1400	1460	1450	1430	1420	1400	1370	1340	1300	1270
1600	1690	1670	1640	1620	1600	1560	1510	1470	1430
1800	1910	1890	1860	1830	1800	1740	1690	1630	1580
2000	2140	2100	2070	2030	2000	1930	1870	1800	1730
2200	2360	2320	2280	2240	2200	2120	2040	1960	1880
2400	2590	2540	2490	2450	2400	2310	2220	2130	2040
2600	2810	2760	2710	2650	2600	2500	2390	2290	2190
2800	3040	2980	2920	2860	2800	2690	2570	2460	2340
3000	3260	3200	3130	3070	3000	2870	2750	2620	2490
3200	3490	3420	3340	3270	3200	3060	2920	2790	2650
3400	3710	3630	3560	3480	3400	3250	3100	2950	2800
3600	3940	3850	3770	3680	3600	3440	3280	3110	2950
3800	4160	4070	3980	3890	3800	3630	3450	3280	3100
4000	4390	4290	4190	4100	4000	3810	3630	3440	3260
4200	4610	4510	4410	4300	4200	4000	3810	3610	3410
4400	4830	4730	4620	4510	4400	4190	3980	3770	3560
4600	5060	4940	4830	4710	4600	4380	4160	3940	3720
4800	5280	5160	5040	4920	4800	4570	4330	4100	3870
5000	5510	5380	5250	5130	5000	4760	4510	4270	4020

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	790	930	1060	1200	1280	1360	1440	1530
1400	960	1110	1250	1400	1490	1570	1660	1760
1600	1130	1290	1440	1600	1690	1790	1880	1980
1800	1300	1470	1630	1800	1900	2000	2100	2210
2000	1480	1650	1830	2000	2100	2210	2320	2430
2200	1650	1830	2020	2200	2310	2420	2540	2660
2400	1820	2010	2210	2400	2520	2640	2760	2880
2600	1990	2190	2400	2600	2720	2850	2980	3110
2800	2160	2370	2590	2800	2930	3060	3200	3330
3000	2330	2550	2780	3000	3140	3270	3410	3560
3200	2500	2740	2970	3200	3340	3490	3630	3780
3400	2670	2920	3160	3400	3550	3700	3850	4010
3600	2850	3100	3350	3600	3750	3910	4070	4230
3800	3020	3280	3540	3800	3960	4120	4290	4460
4000	3190	3460	3730	4000	4170	4340	4510	4680
4200	3360	3640	3920	4200	4370	4550	4730	4910
4400	3530	3820	4110	4400	4580	4760	4950	5140
4600	3700	4000	4300	4600	4790	4980	5170	5360
4800	3870	4180	4490	4800	4990	5190	5390	5590
5000	4050	4360	4680	5000	5200	5400	5600	5810

Takeoff Field & Climb Limit Weights

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	24	26	28	30	42	46	50
1450	216.1	196.4	195.1	193.9	193.3	192.7	192.1	191.5	177.3	172.0	166.5
1600	227.6	207.1	205.8	204.5	203.8	203.2	202.6	202.0	187.2	181.7	176.0
1800	241.7	220.2	218.9	217.5	216.8	216.2	215.5	214.9	199.4	193.6	187.7
2000	254.7	232.3	230.9	229.5	228.8	228.1	227.4	226.8	210.7	204.7	198.5
2200	266.9	243.7	242.2	240.8	240.0	239.3	238.6	237.9	221.3	215.0	208.7
2400	278.4	254.4	252.9	251.4	250.7	249.9	249.2	248.5	231.3	224.8	218.2
2600	289.4	264.7	263.1	261.5	260.8	260.0	259.3	258.5	240.8	234.1	227.3
2800	300.0	274.5	272.9	271.3	270.5	269.7	269.0	268.2	249.9	243.1	236.1
3000	309.4	283.2	281.5	279.9	279.1	278.3	277.5	276.7	257.9	250.8	243.6
3200	317.5	291.4	289.7	288.0	287.1	286.3	285.5	284.7	265.4	258.1	250.7
3400	317.5	299.2	297.5	295.8	294.9	294.1	293.2	292.4	272.6	265.2	257.6
3600	317.5	306.8	305.0	303.2	302.4	301.5	300.6	299.8	279.5	271.9	264.2
3800	317.5	314.0	312.2	310.4	309.5	308.6	307.7	306.9	286.2	278.4	270.5
4000	317.5	317.5	317.5	317.2	316.3	315.4	314.5	313.6	292.6	284.7	276.6
4200	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	298.7	290.7	282.5
4400	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	304.7	296.5	288.1
4600	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	310.3	302.0	293.5
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	315.7	307.3	298.7
CLIMB LIMIT WT (1000 KG)	273.7	272.8	272.7	272.6	272.6	272.5	272.5	272.5	242.3	231.6	220.9

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	24	26	28	30	42	46	50
1450	204.7	185.9	184.7	183.5	182.9	182.3	180.3	178.1	164.2	159.0	154.3
1600	215.7	196.1	194.9	193.6	193.0	192.4	190.3	188.1	173.6	168.2	163.2
1800	229.3	208.8	207.4	206.2	205.5	204.9	202.7	200.3	185.2	179.5	174.3
2000	241.7	220.4	219.0	217.7	217.0	216.4	214.1	211.6	195.9	190.0	184.6
2200	253.4	231.3	229.9	228.5	227.8	227.2	224.8	222.2	206.0	199.8	194.2
2400	264.5	241.7	240.2	238.8	238.1	237.4	234.9	232.3	215.5	209.1	203.4
2600	275.0	251.5	250.0	248.5	247.8	247.1	244.5	241.8	224.5	217.9	212.0
2800	285.2	261.0	259.4	257.9	257.1	256.4	253.8	251.0	233.1	226.4	220.2
3000	294.2	269.2	267.6	266.1	265.3	264.5	261.8	258.9	240.5	233.6	227.3
3200	302.7	277.0	275.4	273.8	273.0	272.2	269.4	266.5	247.6	240.5	234.0
3400	310.8	284.5	282.9	281.2	280.4	279.6	276.7	273.7	254.4	247.1	240.4
3600	317.5	291.8	290.0	288.4	287.5	286.7	283.8	280.7	260.9	253.5	246.7
3800	317.5	298.7	296.9	295.2	294.3	293.5	290.5	287.4	267.2	259.6	252.7
4000	317.5	305.3	303.5	301.8	300.9	300.0	297.0	293.8	273.2	265.5	258.4
4200	317.5	311.7	309.9	308.1	307.2	306.3	303.2	300.0	279.0	271.2	263.9
4400	317.5	317.5	316.0	314.2	313.3	312.4	309.2	305.9	284.6	276.6	269.3
4600	317.5	317.5	317.5	317.5	317.5	317.5	315.0	311.6	289.9	281.8	274.4
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.0	295.1	286.8	279.2
CLIMB LIMIT WT (1000 KG)	262.1	261.2	261.1	261.1	261.0	261.0	256.9	252.4	224.1	213.5	204.4

With engine bleed for packs off, increase field limit weight by 290 kg and climb limit weight by 850 kg.
With engine anti-ice on, decrease field limit weight by 30 kg and climb limit weight by 60 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1600 kg.

Takeoff Field & Climb Limit Weights

Flaps 15

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	24	26	28	30	42	46	50
1450	192.5	174.7	173.6	172.4	170.7	168.8	167.0	165.0	152.4	147.3	143.0
1600	203.0	184.5	183.3	182.1	180.3	178.4	176.4	174.4	161.2	156.0	151.5
1800	216.0	196.6	195.4	194.1	192.2	190.2	188.2	186.0	172.3	166.8	162.1
2000	227.9	207.8	206.5	205.2	203.2	201.1	199.0	196.8	182.5	176.8	171.9
2200	239.1	218.2	216.9	215.6	213.5	211.3	209.1	206.8	192.0	186.1	181.0
2400	249.7	228.1	226.8	225.4	223.3	221.0	218.7	216.4	201.1	195.0	189.7
2600	259.8	237.5	236.1	234.7	232.5	230.2	227.8	225.4	209.6	203.3	197.9
2800	269.5	246.6	245.1	243.6	241.4	239.0	236.6	234.1	217.8	211.3	205.7
3000	278.1	254.4	252.9	251.4	249.1	246.6	244.1	241.5	224.8	218.1	212.4
3200	286.1	261.8	260.3	258.7	256.4	253.8	251.3	248.6	231.4	224.6	218.7
3400	293.8	269.0	267.4	265.8	263.4	260.8	258.1	255.4	237.8	230.8	224.8
3600	301.3	275.8	274.2	272.6	270.1	267.5	264.8	262.0	244.0	236.8	230.6
3800	308.4	282.4	280.8	279.1	276.6	273.9	271.1	268.3	249.9	242.6	236.3
4000	315.2	288.7	287.1	285.4	282.8	280.0	277.2	274.3	255.6	248.1	241.7
4200	317.5	294.8	293.1	291.4	288.7	286.0	283.1	280.2	261.1	253.5	247.0
4400	317.5	300.7	298.9	297.2	294.5	291.6	288.8	285.8	266.4	258.6	252.0
4600	317.5	306.3	304.5	302.7	300.0	297.1	294.2	291.1	271.4	263.6	256.8
4800	317.5	311.6	309.8	308.0	305.2	302.3	299.3	296.3	276.2	268.3	261.4
CLIMB LIMIT WT (1000 KG)	248.6	247.7	247.6	247.5	244.1	240.5	236.8	232.8	208.1	198.3	191.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	24	26	28	30	42	46	50
1450	180.9	163.8	161.8	159.2	157.8	156.4	154.6	152.7	139.8	135.8	132.1
1600	190.9	173.2	171.0	168.3	166.9	165.5	163.5	161.6	148.1	144.0	140.1
1800	203.3	184.7	182.5	179.7	178.2	176.7	174.7	172.6	158.5	154.2	150.1
2000	214.7	195.4	193.1	190.1	188.6	187.1	185.0	182.8	168.2	163.7	159.5
2200	225.5	205.5	203.1	200.0	198.4	196.8	194.6	192.4	177.2	172.6	168.2
2400	235.6	214.9	212.5	209.3	207.6	206.0	203.7	201.4	185.8	181.0	176.4
2600	245.3	223.9	221.4	218.1	216.4	214.7	212.4	210.0	193.8	188.9	184.2
2800	254.5	232.6	229.9	226.5	224.8	223.0	220.6	218.2	201.5	196.4	191.6
3000	262.6	240.0	237.3	233.8	232.0	230.1	227.7	225.2	208.0	202.8	197.8
3200	270.2	247.0	244.2	240.7	238.8	236.9	234.4	231.8	214.2	208.8	203.7
3400	277.6	253.8	250.9	247.3	245.4	243.5	240.9	238.2	220.2	214.7	209.5
3600	284.6	260.3	257.4	253.6	251.7	249.8	247.1	244.4	226.0	220.3	215.0
3800	291.4	266.6	263.6	259.8	257.8	255.8	253.1	250.4	231.5	225.8	220.3
4000	297.9	272.6	269.6	265.7	263.7	261.6	258.9	256.1	236.9	231.0	225.5
4200	304.2	278.4	275.3	271.3	269.3	267.2	264.4	261.6	242.0	236.0	230.4
4400	310.2	284.0	280.8	276.8	274.7	272.6	269.8	266.8	247.0	240.9	235.2
4600	315.9	289.3	286.1	282.0	279.9	277.7	274.9	271.9	251.7	245.5	239.7
4800	317.5	294.4	291.2	287.0	284.8	282.7	279.8	276.7	256.2	250.0	244.1
CLIMB LIMIT WT (1000 KG)	236.0	234.6	231.9	227.3	224.9	222.5	219.0	215.3	191.4	184.7	178.6

With engine bleed for packs off, increase field limit weight by 290 kg and climb limit weight by 850 kg.
With engine anti-ice on, decrease field limit weight by 30 kg and climb limit weight by 60 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1600 kg.

Takeoff Field & Climb Limit Weights
Flaps 15
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	24	26	28	30	42	46	50
1450	169.4	151.6	149.7	147.8	146.0	144.2	142.3	140.4	128.4	124.9	121.3
1600	179.0	160.4	158.5	156.4	154.6	152.7	150.7	148.7	136.3	132.6	128.9
1800	190.8	171.4	169.4	167.2	165.3	163.3	161.3	159.2	146.1	142.3	138.4
2000	201.8	181.6	179.4	177.2	175.2	173.2	171.0	168.9	155.3	151.3	147.3
2200	212.0	191.1	188.9	186.6	184.5	182.4	180.2	177.9	163.9	159.8	155.6
2400	221.7	200.1	197.8	195.5	193.3	191.1	188.8	186.5	172.0	167.7	163.4
2600	230.9	208.6	206.3	203.8	201.6	199.3	197.0	194.6	179.6	175.2	170.8
2800	239.8	216.8	214.3	211.8	209.6	207.2	204.8	202.3	186.9	182.4	177.8
3000	247.4	223.7	221.2	218.6	216.3	213.9	211.4	208.8	192.9	188.3	183.6
3200	254.6	230.3	227.8	225.1	222.7	220.2	217.7	215.1	198.7	194.0	189.1
3400	261.6	236.7	234.1	231.3	228.9	226.3	223.7	221.1	204.3	199.5	194.5
3600	268.3	242.8	240.2	237.4	234.9	232.2	229.6	226.8	209.7	204.8	199.6
3800	274.7	248.7	246.0	243.2	240.6	237.9	235.2	232.4	215.0	209.9	204.7
4000	280.9	254.4	251.6	248.7	246.1	243.4	240.6	237.8	220.0	214.8	209.5
4200	286.8	259.9	257.0	254.1	251.4	248.7	245.9	243.0	224.8	219.6	214.2
4400	292.5	265.1	262.2	259.2	256.5	253.7	250.9	247.9	229.5	224.1	218.6
4600	298.0	270.2	267.2	264.2	261.4	258.6	255.7	252.7	234.0	228.5	222.9
4800	303.2	275.0	272.0	268.9	266.1	263.2	260.3	257.2	238.2	232.7	227.0
CLIMB LIMIT WT (1000 KG)	223.2	217.0	214.4	211.7	208.6	205.4	202.1	198.7	177.8	172.0	166.0

With engine bleed for packs off, increase field limit weight by 290 kg and climb limit weight by 850 kg.
With engine anti-ice on, decrease field limit weight by 30 kg and climb limit weight by 60 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1600 kg.

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Sea Level, 30°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	244.8	264.9	278.7	287.6							
20	225.2	242.7	256.9	268.3	276.9	282.8	287.8				
40	206.9	223.6	237.7	249.4	258.8	266.6	272.9	277.6	281.4	284.8	287.6
60	192.6	209.9	224.0	235.6	245.2	253.2	259.9	265.6	270.5	274.5	277.8
80	181.0	198.7	212.9	224.5	234.2	242.4	249.4	255.3	260.4	264.9	268.9
100	174.7	189.1	203.2	215.0	224.7	233.1	240.3	246.5	251.9	256.6	260.7
120	167.7	180.8	194.7	206.4	216.4	224.9	232.2	238.6	244.2	249.2	253.5
140	160.3	173.2	187.1	198.8	208.9	217.5	224.9	231.5	237.3	242.4	246.9
160	153.6	168.6	180.3	192.0	202.0	210.8	218.3	225.0	230.9	236.2	240.9
180	147.4	163.7	174.2	185.7	195.7	204.5	212.2	219.0	225.0	230.4	235.2
200		158.0	168.9	180.0	190.0	198.8	206.5	213.4	219.5	225.0	229.9
220		152.7	165.9	174.6	184.6	193.4	201.2	208.2	214.4	219.9	224.9
240		147.8	161.0	169.5	179.6	188.4	196.2	203.2	209.5	215.2	220.2
260			156.4	167.4	174.9	183.7	191.5	198.6	204.9	210.6	215.8
280			152.1	163.2	170.4	179.3	187.1	194.2	200.5	206.3	211.6
300			148.0	159.1	167.7	175.1	182.9	190.0	196.4	202.2	207.5

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
30 & BELOW	0	0	0	0	0	0	0	0
32	-2.4	-2.8	-3.3	-3.7	-4.1	-4.6	-5.0	-5.4
34	-4.8	-5.7	-6.5	-7.4	-8.3	-9.1	-10.0	-10.8
36	-7.2	-8.5	-9.8	-11.1	-12.4	-13.7	-14.9	-16.2
38	-9.7	-11.4	-13.1	-14.8	-16.5	-18.2	-19.9	-21.6
40	-12.1	-14.2	-16.4	-18.5	-20.6	-22.8	-24.9	-27.0
42	-14.8	-17.4	-20.0	-22.6	-25.1	-27.7	-30.3	-32.9
44	-17.6	-20.6	-23.6	-26.6	-29.6	-32.7	-35.7	-38.7
46	-20.3	-23.8	-27.2	-30.7	-34.1	-37.6	-41.1	-44.5
48	-23.0	-26.9	-30.8	-34.7	-38.6	-42.5	-46.4	-50.3
50	-25.8	-30.1	-34.5	-38.8	-43.1	-47.5	-51.8	-56.2

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-5.7	-6.5	-7.2	-8.1	-8.8	-9.7	-10.4	-11.2
2000	-11.3	-12.9	-14.5	-16.1	-17.7	-19.3	-20.9	-22.5
3000	-16.9	-19.3	-21.7	-24.1	-26.5	-28.9	-31.3	-33.8
4000	-22.5	-25.7	-28.9	-32.1	-35.3	-38.6	-41.8	-45.0
5000	-28.4	-32.4	-36.5	-40.5	-44.5	-48.5	-52.5	-56.5
6000	-34.4	-39.2	-44.0	-48.8	-53.6	-58.4	-63.2	-68.0
7000	-39.3	-44.9	-50.5	-56.1	-61.7	-67.3	-72.9	-78.5
8000	-44.2	-50.6	-57.0	-63.4	-69.8	-76.2	-82.6	-89.0

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
15 TW	-23.9	-23.4	-23.0	-22.6	-22.1	-21.7	-21.3	-20.8
10 TW	-15.9	-15.6	-15.3	-15.0	-14.8	-14.5	-14.2	-13.9
5 TW	-8.0	-7.8	-7.7	-7.5	-7.4	-7.2	-7.1	-6.9
0	0	0	0	0	0	0	0	0
10 HW	2.9	2.7	2.6	2.4	2.3	2.1	2.0	1.8
20 HW	5.7	5.4	5.1	4.8	4.6	4.3	4.0	3.7
30 HW	9.9	9.2	8.6	8.0	7.4	6.7	6.1	5.5
40 HW	14.0	13.1	12.1	11.1	10.2	9.2	8.2	7.2

With engine bleed for packs off, increase weight by 400 kg.
With engine and wing anti-ice on, decrease weight by 1900 kg.

Takeoff Speeds
Flaps 15
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 15		
	V1	VR	V2
300	159	163	168
290	156	160	165
280	153	157	162
270	150	154	160
260	146	151	157
250	143	147	154
240	139	144	151
230	135	140	148
220	132	137	145
210	128	133	142
200	124	129	139
190	119	126	136
180	114	122	133
170	109	118	129
160	104	113	126
150	99	109	122
140	94	104	119

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	9	11	13			3	4	5	6			-2	-2	-3	-3		
50	122	4	6	8	10	11	13	2	3	4	5	5	6	-1	-1	-2	-2	-3	-3
40	104	1	3	5	7	9	11	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	2	4	6	8	0	0	1	2	3	4	0	0	-1	-1	-2	-2
20	68	0	0	1	2	5	7	0	0	1	1	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	2	4	6	0	0	1	1	2	3	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
300	-5	-2	0	2	4	-2	-1	-1	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
180	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
140	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2

***V1 not to exceed VR**

Takeoff Speeds
Flaps 15
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	109	109	105	106	103	104	102	103				
50	122	112	112	108	108	104	104	102	103	100	101	98	99
40	104	117	117	114	114	110	110	105	106	101	102	98	99
30	86	119	119	119	119	114	115	110	111	106	107	102	103
20	68	120	120	119	119	116	116	113	114	109	110	105	106
-60	-76	121	121	120	120	117	117	114	114	111	111	108	108

Performance Dispatch — Chapter PD
Enroute — Section 11

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	-1	32500*	32500*	32500*	32500*	31900
290	31100	-3	33400*	33400*	33400*	33400*	32700
280	31800	-5	34400*	34400*	34400*	34400*	33400
270	32600	-7	35300*	35300*	35300*	35300*	34200
260	33400	-8	36000*	36000*	36000*	36000*	35000
250	34200	-10	36700*	36700*	36700*	36700*	35800
240	35100	-12	37500*	37500*	37500*	37500*	36600
230	36000	-14	38400*	38400*	38400*	38400*	37500
220	36900	-14	39300*	39300*	39300*	39300*	38500
210	37900	-14	40200*	40200*	40200*	40200*	39400
200	38900	-14	41200*	41200*	41200*	41200*	40400
190	40000	-14	42200*	42200*	42200*	42200*	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	4	31200*	31200*	31200*	31200*	31200*
290	31100	3	32200*	32200*	32200*	32200*	32200*
280	31800	1	33300*	33300*	33300*	33300*	33300*
270	32600	-1	34300*	34300*	34300*	34300*	34200
260	33400	-3	35400*	35400*	35400*	35400*	35000
250	34200	-5	36200*	36200*	36200*	36200*	35800
240	35100	-7	37000*	37000*	37000*	37000*	36600
230	36000	-9	37800*	37800*	37800*	37800*	37500
220	36900	-9	38700*	38700*	38700*	38700*	38500
210	37900	-9	39600*	39600*	39600*	39600*	39400
200	38900	-9	40600*	40600*	40600*	40600*	40400
190	40000	-9	41600*	41600*	41600*	41600*	41500
180	41100	-9	42600*	42600*	42600*	42600*	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	10	26700*	26700*	26700*	26700*	26700*
290	31100	8	27800*	27800*	27800*	27800*	27800*
280	31800	7	30300*	30300*	30300*	30300*	30300*
270	32600	5	31900*	31900*	31900*	31900*	31900*
260	33400	3	33200*	33200*	33200*	33200*	33200*
250	34200	1	34500*	34500*	34500*	34500*	34500*
240	35100	-1	35500*	35500*	35500*	35500*	35500*
230	36000	-3	36300*	36300*	36300*	36300*	36300*
220	36900	-3	37200*	37200*	37200*	37200*	37200*
210	37900	-3	38100*	38100*	38100*	38100*	38100*
200	38900	-3	39100*	39100*	39100*	39100*	39100*
190	40000	-3	40000*	40000*	40000*	40000*	40000*
180	41100	-3	41100*	41100*	41100*	41100*	41100*
170	42300	-3	42100*	42100*	42100*	42100*	42100*
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1051	990	934	885	840	800	767	736	707	680	656
1571	1480	1398	1325	1260	1200	1151	1105	1062	1023	987
2089	1971	1863	1766	1680	1600	1535	1474	1417	1366	1318
2606	2459	2325	2206	2099	2000	1919	1843	1773	1708	1649
3121	2946	2787	2645	2517	2400	2303	2213	2129	2051	1980
3635	3433	3248	3084	2936	2800	2688	2583	2485	2394	2311
4147	3918	3709	3523	3355	3200	3072	2952	2840	2737	2643
4657	4402	4169	3961	3773	3600	3456	3321	3196	3080	2974
5166	4885	4628	4398	4191	4000	3839	3690	3551	3423	3305
5674	5367	5086	4836	4609	4400	4224	4059	3907	3766	3636
6181	5849	5545	5273	5027	4800	4608	4429	4262	4108	3967
6686	6329	6002	5709	5444	5200	4992	4798	4617	4451	4298
7190	6809	6459	6146	5862	5600	5376	5167	4973	4794	4629
7693	7288	6915	6582	6279	6000	5761	5537	5329	5137	4960
8196	7766	7371	7017	6696	6400	6145	5906	5684	5479	5291
8698	8244	7827	7453	7113	6800	6528	6275	6039	5822	5622
9200	8721	8282	7888	7530	7200	6913	6644	6395	6164	5953
9702	9199	8738	8323	7947	7600	7297	7014	6751	6508	6285
10204	9677	9194	8759	8365	8000	7681	7383	7106	6850	6615

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
800	12.4	2:00	12.1	1:58	11.9	1:56	11.7	1:54	11.5	1:52
1200	17.9	2:56	17.4	2:52	17.1	2:49	16.8	2:45	16.5	2:42
1600	23.6	3:51	23.0	3:46	22.5	3:41	22.0	3:36	21.6	3:32
2000	29.4	4:45	28.6	4:39	27.9	4:32	27.3	4:27	26.8	4:22
2400	35.2	5:39	34.2	5:31	33.4	5:24	32.7	5:17	32.1	5:12
2800	41.3	6:32	40.1	6:23	39.1	6:14	38.2	6:07	37.5	6:02
3200	47.4	7:24	46.0	7:14	44.9	7:05	43.8	6:57	43.1	6:52
3600	53.5	8:17	52.0	8:05	50.7	7:55	49.5	7:47	48.7	7:42
4000	59.9	9:08	58.2	8:56	56.7	8:44	55.4	8:36	54.6	8:32
4400	66.3	9:59	64.4	9:46	62.8	9:34	61.4	9:26	60.6	9:22
4800	72.9	10:50	70.8	10:36	68.9	10:23	67.5	10:16	66.8	10:12
5200	79.6	11:40	77.3	11:25	75.3	11:13	73.8	11:05	73.3	11:02
5600	86.4	12:29	83.9	12:14	81.8	12:02	80.3	11:55		
6000	93.3	13:19	90.6	13:03	88.5	12:51	86.9	12:45		
6400	100.4	14:08	97.6	13:52	95.3	13:40	93.8	13:35		
6800	107.6	14:57	104.6	14:41	102.3	14:30	101.0	14:25		
7200	114.9	15:46	111.8	15:30	109.5	15:19	108.4	15:15		
7600	122.4	16:35	119.3	16:19	116.9	16:09				
8000	130.1	17:23	126.8	17:08	124.6	16:58				

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.8	1.6
20	-2.4	-1.1	0.0	1.7	3.6
30	-3.6	-1.8	0.0	2.7	6.0
40	-4.8	-2.4	0.0	3.8	8.7
50	-6.0	-3.0	0.0	5.0	11.7
60	-7.3	-3.7	0.0	6.4	15.0
70	-8.6	-4.3	0.0	7.9	18.7
80	-9.9	-5.0	0.0	9.6	22.8
90	-11.2	-5.7	0.0	11.3	27.1
100	-12.6	-6.4	0.0	13.2	31.9
110	-14.0	-7.1	0.0	15.2	36.9
120	-15.4	-7.8	0.0	17.4	42.3
130	-16.9	-8.6	0.0	19.7	48.0
140	-18.3	-9.3	0.0	22.1	54.1

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
1040	981	928	881	839	800	765	732	703	675	650
1545	1461	1386	1318	1256	1200	1149	1102	1058	1018	981
2050	1941	1843	1754	1673	1600	1533	1471	1414	1361	1312
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643
3060	2900	2757	2627	2508	2400	2301	2209	2125	2047	1974
3564	3380	3214	3063	2925	2800	2685	2579	2481	2390	2306
4069	3859	3670	3499	3343	3200	3069	2948	2837	2733	2637
4573	4339	4127	3935	3760	3600	3453	3318	3192	3076	2968
5078	4818	4584	4371	4177	4000	3837	3687	3548	3419	3300
5582	5297	5040	4807	4595	4400	4221	4056	3904	3763	3631
6086	5776	5497	5243	5012	4800	4605	4426	4260	4106	3963
6590	6256	5953	5679	5429	5200	4990	4795	4616	4449	4294
7094	6735	6410	6115	5846	5600	5374	5165	4972	4792	4626
7598	7214	6867	6551	6264	6000	5758	5534	5328	5136	4957
8103	7693	7323	6987	6681	6400	6142	5904	5683	5479	5289
8607	8173	7780	7423	7098	6800	6526	6273	6039	5822	5620
9111	8652	8237	7859	7515	7200	6910	6643	6395	6165	5952
9616	9131	8693	8296	7933	7600	7294	7012	6751	6508	6283
10121	9611	9150	8732	8350	8000	7678	7381	7107	6852	6614

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG) 140	150	160	170	180	190	200	210	220	TIME (HRS:MIN)
800	9.6	10.1	10.4	11.0	11.5	11.9	12.4	13.0	13.5	1:51
1200	13.6	14.2	14.9	15.7	16.4	17.1	17.9	18.7	19.4	2:41
1600	17.7	18.5	19.5	20.5	21.4	22.4	23.5	24.6	25.4	3:31
2000	21.9	22.9	24.2	25.5	26.6	27.9	29.3	30.6	31.7	4:21
2400	26.1	27.5	28.9	30.5	31.9	33.5	35.1	36.7	38.1	5:11
2800	30.5	32.1	33.8	35.6	37.4	39.2	41.1	42.9	44.7	6:00
3200	35.0	36.8	38.8	40.9	43.0	45.1	47.2	49.4	51.5	6:50
3600	39.5	41.7	43.9	46.4	48.7	51.1	53.5	56.0	58.4	7:40
4000	44.2	46.6	49.2	51.9	54.5	57.2	60.0	62.8	65.5	8:29
4400	49.0	51.7	54.6	57.6	60.5	63.5	66.6	69.8	72.7	9:19
4800	53.9	56.8	60.1	63.5	66.6	70.0	73.5	76.9	80.2	10:09
5200	58.9	62.2	65.7	69.4	72.9	76.6	80.4	84.2	87.8	10:58
5600	64.0	67.7	71.5	75.5	79.3	83.4	87.6	91.6	95.7	11:48
6000	69.2	73.3	77.4	81.7	85.9	90.4	94.9	99.3	103.7	12:37
6400	74.6	79.0	83.4	88.1	92.7	97.5	102.4	107.2		13:27
6800	80.2	84.8	89.6	94.7	99.7	104.8	110.1	115.4		14:17
7200	85.8	90.8	96.0	101.5	106.8	112.3				15:06
7600	91.6	96.9	102.5	108.4	114.1	120.0				15:56
8000	97.5	103.2	109.3	115.5	121.6	127.9				16:46

Based on 310/.84 climb, LRC and .84/310/250 descent.
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
93	79	69	61	55	50	46	42	39	36	34
159	142	129	117	108	100	93	87	82	77	73
224	204	187	173	161	150	141	133	125	119	113
287	264	245	228	213	200	189	178	169	161	153
349	324	301	282	265	250	237	224	214	204	195
411	382	358	336	317	300	285	271	258	247	236
472	441	414	390	369	350	333	317	303	290	278
534	500	471	445	421	400	381	364	348	333	320
597	560	528	499	473	450	429	410	392	376	361
661	621	586	554	526	500	477	456	436	418	402

Trip Fuel and Time Required

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	0:14
	ALT (FT)	10000	10000	9000	8000	8000	
100	FUEL (1000 KG)	2.3	2.4	2.6	2.7	2.9	0:22
	ALT (FT)	19000	18000	17000	16000	15000	
150	FUEL (1000 KG)	3.0	3.2	3.4	3.6	3.8	0:30
	ALT (FT)	27000	25000	24000	22000	21000	
200	FUEL (1000 KG)	3.6	3.9	4.1	4.4	4.6	0:36
	ALT (FT)	34000	31000	29000	28000	26000	
250	FUEL (1000 KG)	4.2	4.5	4.8	5.1	5.4	0:43
	ALT (FT)	39000	36000	34000	32000	30000	
300	FUEL (1000 KG)	4.7	5.0	5.4	5.8	6.2	0:48
	ALT (FT)	43000	40000	37000	35000	33000	
350	FUEL (1000 KG)	5.1	5.6	6.0	6.5	6.9	0:54
	ALT (FT)	43000	42000	39000	36000	34000	
400	FUEL (1000 KG)	5.6	6.1	6.6	7.1	7.6	1:00
	ALT (FT)	43000	42000	39000	36000	34000	
450	FUEL (1000 KG)	6.1	6.6	7.2	7.8	8.3	1:06
	ALT (FT)	43000	42000	39000	36000	34000	
500	FUEL (1000 KG)	6.6	7.2	7.8	8.4	9.1	1:13
	ALT (FT)	43000	42000	39000	36000	34000	

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	8700	8640	8370	8470	8880	9070	9420			
280	8110	8030	7780	7780	8110	8350	8600	9090		
260	7540	7450	7370	7150	7470	7650	7850	8110		
240	7120	7020	6920	6700	6750	6970	7120	7410		
220	6560	6460	6340	6280	6100	6330	6430	6620	7170	
200	6020	5920	5780	5700	5520	5600	5750	5900	6260	
180	5640	5390	5260	5160	5100	4940	5150	5210	5530	5750
160	5130	5020	4760	4650	4580	4520	4430	4640	4880	5110
140	4660	4530	4390	4160	4070	4010	3880	3950	4190	4340

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	9360	9070	9040	9070	9130
280	8700	8630	8370	8390	8430
260	8070	7980	7710	7710	7870
240	7440	7350	7260	7180	7190
220	6970	6880	6760	6540	6540
200	6360	6270	6160	6070	5900
180	5910	5680	5570	5470	5290
160	5340	5230	5000	4900	4820
140	4800	4670	4550	4340	4250

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements
Required Pressure (PSI) for One 114/115 Cubic Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	530	735	945
45	113	520	725	930
40	104	510	715	915
35	95	505	700	900
30	86	495	690	885
25	77	485	680	870
20	68	480	670	860
15	59	470	655	840
10	50	460	645	830
5	41	455	635	815
0	32	445	620	800
-5	23	440	610	785
-10	14	430	600	770

For more extensive than normal crew usage, add 1.2 psi/person/minute.

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
28	150.4		
27	160.1	152.8	
26	170.3	162.6	153.6
25	180.8	172.5	163.0
24	188.8	180.2	170.5
23	197.1	188.2	178.2
22	205.6	196.5	186.2
21	214.5	205.0	194.5
20	223.7	213.8	203.0
19	232.4	222.4	211.4
18	241.4	231.2	220.1
17	250.6	240.3	229.0
16	258.9	248.3	236.5
15	266.3	255.0	242.5
14	273.7	261.4	248.1
13	281.1	267.9	252.8
12	288.5	274.4	257.6
11	293.7	281.3	265.8
10	298.7	287.4	274.1
9	303.9	290.9	277.8
8	307.6	294.7	281.3
7	311.2	298.4	284.8
6	314.9	301.9	288.4

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)									
	PRESSURE ALTITUDE (1000 FT)									
	6	8	10	12	14	16	18	20	22	24
ENGINE ONLY	-4.3	-4.8	-4.9	-4.1	-3.4	-2.7	-1.9	-1.2	-1.3	-1.0
ENGINE AND WING	-5.8	-6.5	-6.5	-5.6	-4.8	-4.2	-3.3	-2.9	-3.0	-2.6

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
282	260	242	226	212	200	189	179	170	162	155
566	523	485	453	425	400	378	358	340	324	309
850	785	729	680	638	600	567	537	510	486	464
1134	1047	972	907	850	800	755	716	680	647	618
1418	1309	1215	1134	1063	1000	944	894	850	809	772
1703	1571	1458	1361	1275	1200	1133	1073	1019	971	927
1987	1833	1702	1588	1488	1400	1322	1252	1189	1132	1081
2271	2095	1945	1814	1700	1600	1511	1431	1359	1294	1235
2555	2357	2188	2041	1913	1800	1700	1610	1529	1456	1389
2839	2619	2431	2268	2126	2000	1888	1789	1699	1617	1544
3124	2882	2674	2495	2338	2200	2077	1967	1869	1779	1698
3408	3144	2918	2722	2551	2400	2266	2146	2038	1941	1852
3692	3406	3161	2949	2763	2600	2455	2325	2208	2103	2007
3976	3668	3404	3176	2976	2800	2644	2504	2378	2264	2161
4260	3930	3647	3403	3189	3000	2832	2683	2548	2426	2315

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.4	4.6	4.8	5.1	5.3	5.4	5.6	5.9
400	8.1	8.5	8.8	9.2	9.5	9.8	10.1	10.5
600	11.7	12.3	12.8	13.4	13.8	14.1	14.6	15.2
800	15.2	16.0	16.6	17.4	18.0	18.5	19.1	19.8
1000	18.8	19.7	20.5	21.4	22.2	22.8	23.5	24.4
1200	22.4	23.4	24.3	25.4	26.3	27.0	27.8	28.8
1400	25.9	27.1	28.2	29.4	30.5	31.3	32.2	33.3
1600	29.5	30.7	32.0	33.3	34.6	35.6	36.6	37.8
1800	33.0	34.3	35.7	37.2	38.6	39.7	40.8	42.2
2000	36.6	37.8	39.4	41.0	42.6	43.9	45.1	46.6
2200	40.1	41.4	43.1	44.9	46.6	48.0	49.4	51.0
2400	43.7	44.9	46.9	48.7	50.6	52.2	53.7	55.3
2600	47.2	48.5	50.5	52.5	54.5	56.2	57.9	59.6
2800	50.8	52.1	54.0	56.2	58.3	60.2	62.0	63.9
3000	54.3	55.6	57.6	59.9	62.2	64.2	66.2	68.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (3%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engine cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	227	212	200	189	179	170	162	155
572	527	488	455	426	400	377	357	339	322	307
861	792	734	683	639	600	566	535	508	483	460
1150	1058	979	911	852	800	754	713	676	643	613
1439	1323	1224	1139	1065	1000	942	891	845	804	766
1729	1589	1470	1367	1278	1200	1131	1069	1014	964	919
2018	1854	1715	1595	1491	1400	1319	1247	1183	1125	1072
2307	2119	1960	1823	1704	1600	1508	1425	1352	1285	1225
2596	2385	2206	2052	1918	1800	1696	1603	1520	1446	1378
2885	2650	2451	2280	2131	2000	1884	1781	1689	1606	1531
3174	2916	2696	2508	2344	2200	2073	1960	1858	1766	1683
3463	3181	2942	2736	2557	2400	2261	2138	2027	1927	1836
3752	3447	3187	2964	2770	2600	2450	2316	2196	2087	1989
4041	3712	3432	3192	2983	2800	2638	2494	2364	2248	2142
4330	3977	3678	3420	3196	3000	2826	2672	2533	2408	2295

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.0	4.3	4.5	4.8	5.0	5.3	5.6	5.8
400	7.4	7.9	8.3	8.7	9.2	9.6	10.1	10.5
600	10.6	11.3	12.0	12.7	13.3	14.0	14.6	15.3
800	13.8	14.7	15.6	16.5	17.4	18.3	19.2	20.0
1000	16.9	18.1	19.2	20.3	21.4	22.5	23.5	24.6
1200	20.1	21.5	22.8	24.1	25.3	26.6	27.9	29.1
1400	23.3	24.8	26.4	27.8	29.3	30.8	32.3	33.7
1600	26.5	28.2	29.9	31.6	33.3	35.0	36.6	38.2
1800	29.6	31.3	33.3	35.2	37.1	39.0	40.8	42.6
2000	32.8	34.5	36.7	38.8	40.8	42.9	45.0	47.0
2200	36.0	37.7	40.1	42.4	44.6	46.9	49.1	51.3
2400	39.2	40.9	43.4	45.9	48.4	50.9	53.3	55.7
2600	42.3	44.0	46.8	49.5	52.1	54.8	57.4	59.9
2800	45.5	47.2	50.0	52.9	55.7	58.5	61.3	64.1
3000	48.7	50.4	53.2	56.3	59.3	62.3	65.3	68.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
264	248	234	221	210	200	190	182	174	167	160
530	498	469	443	420	400	381	364	348	334	320
799	749	705	666	631	600	571	545	521	500	480
1069	1002	942	889	842	800	761	726	694	665	638
1342	1256	1180	1113	1053	1000	951	907	867	830	796
1615	1511	1419	1337	1265	1200	1141	1087	1039	995	954
1890	1767	1658	1562	1476	1400	1330	1268	1211	1159	1111
2167	2023	1898	1787	1688	1600	1520	1448	1382	1323	1268
2444	2280	2138	2012	1900	1800	1709	1628	1554	1486	1424
2721	2538	2378	2237	2112	2000	1899	1808	1725	1649	1580
2999	2796	2618	2462	2323	2200	2088	1988	1896	1813	1736
3277	3054	2859	2687	2535	2400	2277	2167	2067	1976	1893
3555	3312	3099	2913	2747	2600	2467	2347	2238	2139	2049
3833	3569	3340	3138	2959	2800	2656	2527	2410	2303	2205
4110	3827	3580	3363	3171	3000	2846	2707	2581	2466	2361

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	3.8	4.0	4.3	4.5	4.7	4.9	5.2	5.3
400	6.4	6.9	7.4	7.9	8.5	9.0	9.6	10.0
600	8.8	9.6	10.5	11.3	12.1	13.0	13.8	14.6
800	11.3	12.4	13.5	14.6	15.7	16.9	18.1	19.1
1000	13.7	15.1	16.5	17.9	19.3	20.8	22.3	23.6
1200	16.1	17.8	19.4	21.1	22.9	24.6	26.4	28.0
1400	18.5	20.4	22.3	24.3	26.3	28.4	30.5	32.3
1600	20.8	23.0	25.2	27.5	29.8	32.2	34.5	36.7
1800	23.2	25.6	28.1	30.6	33.2	35.9	38.5	40.9
2000	25.5	28.2	30.9	33.7	36.6	39.5	42.5	45.2
2200	27.7	30.7	33.7	36.8	40.0	43.2	46.4	49.3
2400	30.0	33.2	36.5	39.8	43.3	46.7	50.2	53.5
2600	32.2	35.7	39.2	42.9	46.5	50.3	54.1	57.6
2800	34.4	38.1	41.9	45.8	49.8	53.8	57.9	61.6
3000	36.6	40.6	44.6	48.8	53.0	57.3	61.6	65.6

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - 320 KIAS Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
292	267	246	229	213	200	188	178	168	160	152
566	523	485	453	425	400	378	358	340	324	309
840	778	724	678	636	600	568	538	512	488	467
1115	1034	963	902	848	800	757	719	684	653	624
1390	1289	1202	1126	1059	1000	947	899	856	817	781
1664	1545	1441	1351	1271	1200	1137	1080	1028	981	938
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1096
2213	2056	1919	1799	1694	1600	1516	1440	1372	1310	1253
2488	2311	2158	2024	1905	1800	1706	1621	1544	1474	1410
2763	2567	2397	2248	2117	2000	1895	1801	1716	1638	1567
3037	2822	2636	2473	2328	2200	2085	1981	1888	1802	1725
3312	3078	2875	2697	2540	2400	2275	2162	2060	1967	1882
3587	3334	3114	2921	2751	2600	2464	2342	2232	2131	2039
3861	3589	3353	3146	2963	2800	2654	2523	2404	2295	2196
4136	3845	3592	3370	3174	3000	2844	2703	2576	2460	2354

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.3	4.5	4.6	4.8	5.1	5.3	5.5	5.8
400	8.1	8.3	8.6	8.9	9.3	9.7	10.1	10.5
600	11.8	12.2	12.6	13.0	13.5	14.0	14.6	15.3
800	15.5	15.9	16.4	17.0	17.7	18.4	19.2	20.0
1000	19.2	19.7	20.3	21.0	21.7	22.6	23.5	24.6
1200	22.9	23.5	24.2	25.0	25.8	26.8	27.9	29.1
1400	26.6	27.3	28.1	28.9	29.9	31.0	32.3	33.6
1600	30.3	31.0	31.9	32.9	34.0	35.3	36.7	38.2
1800	34.1	34.7	35.7	36.7	38.0	39.4	40.9	42.6
2000	37.8	38.4	39.4	40.6	41.9	43.5	45.1	47.0
2200	41.5	42.1	43.2	44.5	45.9	47.5	49.3	51.3
2400	45.2	45.8	47.0	48.4	49.9	51.6	53.6	55.7
2600	48.9	49.6	50.7	52.2	53.8	55.7	57.7	60.0
2800	52.6	53.3	54.4	56.0	57.7	59.6	61.8	64.2
3000	56.3	57.0	58.1	59.7	61.6	63.6	65.9	68.4

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - .84M/320 KIAS Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
259	244	231	220	209	200	191	183	175	169	162
519	490	464	440	419	400	382	366	351	337	325
781	736	697	661	629	600	573	549	526	505	486
1044	984	930	882	839	800	764	731	701	673	648
1307	1232	1164	1103	1049	1000	955	913	876	841	809
1572	1480	1398	1325	1259	1200	1145	1096	1050	1008	970
1836	1728	1633	1547	1469	1400	1336	1278	1225	1176	1130
2101	1977	1867	1768	1680	1600	1527	1460	1399	1343	1291
2366	2226	2101	1990	1890	1800	1717	1642	1573	1510	1452
2631	2475	2336	2212	2100	2000	1908	1824	1748	1677	1613
2895	2723	2570	2433	2311	2200	2099	2007	1922	1845	1773
3159	2971	2804	2655	2521	2400	2289	2189	2097	2013	1935
3421	3218	3037	2876	2731	2600	2480	2372	2272	2180	2096
3683	3464	3270	3097	2941	2800	2671	2554	2447	2349	2258
3943	3710	3502	3317	3150	3000	2862	2737	2623	2517	2420

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.0	4.2	4.3	4.5	4.6	4.8	5.0	5.1
400	7.3	7.6	7.9	8.2	8.6	9.0	9.4	9.7
600	10.6	11.0	11.4	11.9	12.4	13.0	13.7	14.3
800	13.8	14.3	14.9	15.5	16.2	17.0	17.9	18.8
1000	17.1	17.6	18.3	19.1	19.9	21.0	22.1	23.2
1200	20.3	20.9	21.7	22.6	23.7	24.9	26.2	27.5
1400	23.5	24.2	25.1	26.2	27.4	28.8	30.3	31.9
1600	26.7	27.5	28.5	29.7	31.1	32.6	34.3	36.1
1800	29.9	30.8	31.9	33.2	34.7	36.4	38.3	40.4
2000	33.1	34.1	35.3	36.7	38.3	40.2	42.3	44.6
2200	36.2	37.3	38.6	40.2	41.9	44.0	46.3	48.7
2400	39.4	40.6	42.0	43.6	45.5	47.8	50.2	52.8
2600	42.6	43.8	45.3	47.0	49.1	51.5	54.1	56.9
2800	45.7	47.0	48.6	50.5	52.6	55.2	58.0	61.0
3000	48.9	50.2	51.9	53.9	56.2	58.8	61.8	65.0

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (11%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Intentionally
Blank

Performance Dispatch — Chapter PD
Landing — Section 12

Landing Field Limit Weight - Dry Runway
Flaps 30
Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200				1200	1250	1350	1410	1500
1400		1130	1250	1400	1460	1560	1630	1730
1600	1200	1310	1440	1600	1670	1770	1860	1960
1800	1370	1490	1630	1800	1880	1980	2080	2190
2000	1540	1670	1830	2000	2090	2190	2300	2420
2200	1710	1860	2020	2200	2310	2400	2530	2650
2400	1880	2040	2210	2400	2520	2610	2750	2880
2600	2050	2220	2400	2600	2730	2820	2970	3110
2800	2220	2380	2580	2800	2940	3030	3190	3340
3000	2350	2530	2750	3000	3150	3240	3420	3570
3200	2480	2690	2930	3200	3360	3450	3640	3800
3400	2620	2840	3100	3400	3570	3660	3860	
3600	2750	3000	3280	3600	3780	3870		
3800	2880	3160	3450	3800				
4000	3010	3310	3620	4000				
4200	3140	3470	3800					
4400	3280	3620	3980					
4600	3410	3780	4150					
4800	3540	3940						
5000	3670	4090						

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1200	144.2	135.7			
1400	177.2	166.9	156.9	147.3	138.2
1600	210.9	198.6	186.7	175.4	164.8
1800	234.8	226.6	217.2	204.1	191.8
2000	253.9	245.1	236.4	227.9	219.2
2200	272.1	262.8	253.5	244.5	235.7
2400	289.3	279.5	269.9	260.4	251.0
2600	305.4	295.4	285.4	275.5	265.8
2800	321.0	310.4	300.1	289.9	279.8
3000		322.9	311.6	301.3	291.2
3200			322.1	311.3	300.9
3400				320.8	309.9
3600					318.6
3800					327.4

With 1 brake deactivated, decrease weight by 16200 kg.
With 2 brakes deactivated, decrease weight by 32900 kg.
With manual speedbrakes, decrease weight by 17500 kg.

Landing Field Limit Weight - Wet Runway

Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200						1360	1420	1520
1400				1400	1460	1570	1640	1750
1600		1290	1430	1600	1670	1780	1870	1980
1800	1350	1470	1620	1800	1880	1990	2090	2210
2000	1520	1650	1810	2000	2090	2200	2310	2440
2200	1690	1830	2000	2200	2300	2410	2540	2670
2400	1860	2020	2190	2400	2510	2620	2760	2900
2600	2030	2200	2390	2600	2720	2830	2980	3130
2800	2200	2380	2580	2800	2940	3040	3200	3360
3000	2370	2560	2770	3000	3150	3250	3430	3590
3200	2540	2720	2940	3200	3360	3460	3650	3820
3400	2670	2870	3120	3400	3570	3670	3870	4050
3600	2800	3030	3290	3600	3780	3880	4100	4280
3800	2940	3180	3470	3800	3990	4090	4320	
4000	3070	3340	3640	4000	4200			
4200	3200	3500	3820	4200				
4400	3330	3650	3990	4400				
4600	3460	3810	4170	4600				
4800	3600	3960	4340					
5000	3730	4120	4520					

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	147.1	138.4			
1600	175.8	165.5	155.6	146.1	137.0
1800	205.0	193.0	181.5	170.5	160.1
2000	228.7	219.3	207.9	195.4	183.5
2200	245.7	237.2	228.7	219.9	207.2
2400	262.0	252.9	244.0	235.2	226.7
2600	277.4	267.9	258.6	249.4	240.4
2800	292.1	282.3	272.6	263.0	253.6
3000	306.0	296.0	286.1	276.1	266.4
3200	319.6	309.1	298.8	288.7	278.6
3400		320.2	309.3	299.1	289.0
3600			318.5	307.8	297.6
3800				316.2	305.6
4000				324.5	313.3
4200					320.9

With 1 brake deactivated, decrease weight by 16200 kg.
With 2 brakes deactivated, decrease weight by 32900 kg.
With manual speedbrakes, decrease weight by 17500 kg.

Landing Climb Limit Weight
Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
(C)	(F)	0	2000	4000	6000	8000
54	129	221.5				
52	126	227.6				
50	122	233.9	215.5			
48	118	240.1	220.9			
46	115	245.7	226.4	208.9		
44	111	251.0	232.0	214.3		
42	108	256.6	237.5	219.5	201.7	
40	104	262.1	242.7	224.4	206.4	
38	100	267.6	247.6	228.8	211.0	194.1
36	97	273.4	252.4	233.2	215.4	198.3
34	93	279.1	257.1	237.7	219.6	202.4
32	90	284.5	262.2	242.2	223.7	206.4
30	86	289.8	267.4	246.5	227.7	210.2
28	82	289.9	272.7	250.9	231.8	213.9
26	79	289.9	277.7	255.3	235.8	217.7
24	75	290.0	277.8	259.4	239.1	221.4
22	72	290.1	277.9	263.3	242.2	224.9
20	68	290.1	277.9	263.4	245.4	226.8
18	64	290.2	277.9	263.4	248.3	228.7
16	61	290.2	278.0	263.5	248.9	230.7
14	57	290.3	278.0	263.5	249.5	232.6
12	54	290.3	278.1	263.5	249.8	233.9
10	50	290.3	278.1	263.6	249.9	235.1
-40	-40	291.5	279.3	264.7	250.9	237.8

Based on engine bleed for 2 packs on and engine anti-ice on or off and wing anti-ice off.
With packs off, increase allowable weight by 1000 kg.
With engine and wing anti-ice on, decrease allowable weight by 1550 kg.
When operating in icing conditions during any part of the flight when forecast landing temperatures below 10°C, decrease allowable weight by 20250 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 20, Gear Up

Based on engine bleed for packs on or off, engine anti-ice on or off and wing anti-ice off.

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)											
	PRESSURE ALTITUDE (FT)											
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	5.48	4.88	4.30									
50	6.22	5.62	5.02	4.47	3.92							
46	6.90	6.35	5.74	5.14	4.53	4.04	3.50					
42	7.46	7.02	6.47	5.84	5.24	4.69	4.16	3.58	3.04			
38	8.03	7.65	7.19	6.54	5.93	5.32	4.74	4.18	3.62	3.08	2.55	
34	8.59	8.25	7.83	7.18	6.53	5.90	5.29	4.71	4.14	3.61	3.07	2.86
30	8.61	8.54	8.43	7.78	7.12	6.45	5.82	5.23	4.65	4.09	3.54	3.32
26	8.61	8.55	8.44	8.07	7.69	6.98	6.33	5.68	5.11	4.55	3.99	3.76
22	8.61	8.55	8.44	8.07	7.69	7.24	6.79	6.07	5.44	4.90	4.39	4.14
18	8.62	8.56	8.45	8.08	7.70	7.24	6.80	6.30	5.73	5.12	4.58	4.36
14	8.63	8.56	8.45	8.08	7.70	7.25	6.81	6.38	5.91	5.32	4.74	4.52
10	8.63	8.57	8.46	8.09	7.71	7.25	6.81	6.38	5.95	5.45	4.90	4.68

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
280	-3.15	-3.56	-3.96	-4.36	-4.78	-5.17	-5.56	-5.95	-6.32	-6.73
260	-2.77	-3.12	-3.47	-3.82	-4.18	-4.53	-4.86	-5.19	-5.52	-5.86
240	-2.24	-2.54	-2.84	-3.13	-3.42	-3.71	-3.98	-4.24	-4.51	-4.79
220	-1.66	-1.87	-2.09	-2.31	-2.51	-2.72	-2.92	-3.11	-3.31	-3.51
200	-0.93	-1.05	-1.17	-1.29	-1.40	-1.51	-1.63	-1.73	-1.84	-1.96
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	1.12	1.28	1.45	1.61	1.72	1.87	2.03	2.18	2.33	2.51
140	2.57	2.95	3.33	3.71	3.97	4.31	4.67	5.03	5.40	5.78

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
VREF	-0.25	-0.30	-0.30	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.32
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.19	0.17	0.17	0.18	0.18	0.17	0.17	0.16	0.15	0.14
VREF+15	0.30	0.30	0.30	0.29	0.28	0.27	0.26	0.24	0.22	0.20
VREF+20	0.37	0.39	0.38	0.35	0.33	0.30	0.28	0.26	0.23	0.20
VREF+25	0.44	0.45	0.42	0.37	0.33	0.28	0.24	0.21	0.17	0.14
VREF+30	0.50	0.46	0.41	0.35	0.28	0.21	0.15	0.10	0.05	0.02

With engine and wing anti-ice on, decrease gradient by 0.1%.
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 0.6%.

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235				
50	122	236	227			
45	113	238	229	220		
40	104	241	231	222	214	
35	95	243	233	224	216	208
30	86	245	235	226	217	209
25	77	247	238	228	219	211
20	68	249	240	230	221	213
15	59	252	242	232	223	215
10	50	254	244	235	225	217
5	41	257	247	237	228	219
0	32	259	249	239	230	221
-5	23	262	252	242	232	223
-10	14	265	254	244	234	225
-15	5	268	257	247	237	227
-20	-4	271	260	249	239	230
-30	-22	277	266	255	245	235
-40	-40	284	272	261	250	240
-50	-58	291	279	268	256	246
-54	-65	294	282	270	259	248

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 6100 kg per 1% downhill slope. Increase weight by 5800 kg per 10 knots headwind. Decrease weight by 36600 kg per 10 knots tailwind.

Decrease weight by 13000 kg when one brake is deactivated. Decrease weight by 26800 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

Intentionally
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GEAR DOWN

Takeoff Climb Limit Weight
Flaps 15

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	171.6	166.6	160.6	148.4	
52	126	175.6	166.6	160.5	148.4	
50	122	179.5	167.4	160.5	148.3	
48	118	183.3	171.2	160.4	148.2	
46	115	187.0	174.9	161.2	148.2	
44	111	190.6	178.6	164.9	148.1	
42	108	194.2	182.2	168.6	149.0	
40	104	197.9	185.8	172.1	152.7	
38	100	202.1	189.3	175.6	156.3	
36	97	206.4	192.9	179.1	159.9	
34	93	210.6	197.0	182.5	163.4	
32	90	214.8	201.0	185.9	167.0	148.5
30	86	218.9	205.0	189.8	170.5	152.1
28	82	223.0	209.0	193.7	174.0	155.7
26	79	227.0	212.9	197.5	177.8	159.2
24	75	229.0	216.7	201.2	181.5	162.8
22	72	229.0	220.5	204.9	185.2	166.6
20	68	229.0	222.3	208.5	188.8	170.2
18	64	229.0	222.3	212.0	192.3	173.7
16	61	229.0	222.3	213.6	195.8	177.2
14	57	229.0	222.3	213.6	199.2	180.6
12	54	229.0	222.3	213.6	200.7	184.0
10	50	229.0	222.3	213.5	200.6	187.3
-40	-40	228.5	221.8	212.1	199.4	187.6

With engine bleeds for packs off, increase weight by 100 kg.
With engine anti-ice on, decrease weight by 4450 kg.
With engine and wing anti-ice on, decrease weight by 5550 kg.

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	191.7				
52	126	196.5				
50	122	201.2	186.4			
48	118	206.0	190.5			
46	115	210.9	194.6	180.9		
44	111	215.8	199.3	185.4		
42	108	220.9	204.4	189.9	174.6	
40	104	225.9	209.3	194.0	178.6	
38	100	230.7	213.7	197.7	182.5	168.1
36	97	235.4	217.9	201.4	186.3	171.7
34	93	239.7	221.8	205.2	189.9	175.2
32	90	244.0	226.1	208.9	193.3	178.5
30	86	248.2	230.3	212.6	196.7	181.7
28	82	248.3	234.5	216.3	200.1	184.8
26	79	248.3	238.4	219.9	203.4	188.0
24	75	248.4	238.5	223.4	205.9	191.0
22	72	248.4	238.5	226.7	208.4	194.0
20	68	248.5	238.6	226.7	210.9	195.5
18	64	248.5	238.6	226.8	213.3	196.9
16	61	248.5	238.6	226.8	214.1	198.3
14	57	248.6	238.7	226.8	214.9	199.8
12	54	248.6	238.7	226.9	215.2	201.0
10	50	248.6	238.7	226.9	215.3	202.1
-40	-40	249.6	239.7	227.9	216.2	204.9

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight 800 kg.
With engine and wing anti-ice on, decrease weight by 1300 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24800 kg.

GEAR DOWN

Takeoff Obstacle Limit Weight

Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off
Flaps 15
Sea Level, 30°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	220.0										
20	218.8	220.0									
40	200.7	214.3									
60	187.8	201.5	212.1								
80	177.5	191.1	202.0	210.7	217.7						
100	168.7	182.3	193.2	202.2	209.6	215.7	219.8	220.0			
120	161.1	174.6	185.6	194.7	202.4	208.8	214.2	218.7	220.0	220.0	
140	154.4	167.7	178.8	188.0	195.8	202.5	208.1	213.0	217.3	219.9	220.0
160	148.3	161.6	172.6	181.9	189.9	196.6	202.5	207.6	212.0	215.9	219.0
180		156.0	167.0	176.4	184.4	191.3	197.3	202.5	207.1	211.2	214.8
200		150.9	161.9	171.2	179.3	186.3	192.4	197.7	202.5	206.7	210.4
220			157.1	166.5	174.5	181.6	187.8	193.3	198.1	202.4	206.3
240			152.7	162.0	170.1	177.2	183.5	189.0	194.0	198.4	202.4
260			148.5	157.9	166.0	173.1	179.4	185.1	190.1	194.6	198.6
280				153.9	162.1	169.2	175.6	181.3	186.4	190.9	195.1
300				150.2	158.4	165.6	171.9	177.7	182.8	187.4	191.7

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	120	140	160	180	200	220	240
30 & BELOW	0	0	0	0	0	0	0
32	-1.5	-2.0	-2.6	-3.1	-3.7	-4.2	-4.8
34	-3.0	-4.1	-5.2	-6.3	-7.4	-8.5	-9.6
36	-4.5	-6.2	-7.8	-9.4	-11.1	-12.8	-14.4
38	-6.0	-8.2	-10.4	-12.6	-14.8	-17.0	-19.2
40	-7.5	-10.2	-13.0	-15.8	-18.5	-21.2	-24.0
42	-9.0	-12.3	-15.6	-18.9	-22.2	-25.5	-28.8
44	-10.5	-14.4	-18.2	-22.1	-25.9	-29.8	-33.6
46	-12.0	-16.4	-20.8	-25.2	-29.6	-34.0	-38.4
48	-13.5	-18.4	-23.4	-28.4	-33.3	-38.2	-43.2
50	-15.0	-20.5	-26.0	-31.5	-37.0	-42.5	-48.0

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	120	140	160	180	200	220	240
S.L. & BELOW	0	0	0	0	0	0	0
1000	-4.1	-4.9	-5.7	-6.5	-7.3	-8.1	-8.9
2000	-8.1	-9.8	-11.4	-13.0	-14.6	-16.2	-17.9
3000	-12.6	-15.0	-17.4	-19.8	-22.1	-24.5	-26.9
4000	-17.1	-20.2	-23.4	-26.5	-29.6	-32.8	-35.9
5000	-21.4	-25.4	-29.3	-33.2	-37.2	-41.1	-45.1
6000	-25.8	-30.5	-35.2	-40.0	-44.8	-49.5	-54.2
7000	-29.6	-35.2	-40.9	-46.5	-52.1	-57.8	-63.4
8000	-33.5	-40.0	-46.5	-53.0	-59.5	-66.0	-72.5

GEAR DOWN

Takeoff Obstacle Limit Weight

Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	120	140	160	180	200	220	240
15 TW	-22.0	-21.0	-20.0	-19.0	-18.0	-17.0	-16.0
10 TW	-14.7	-14.0	-13.3	-12.7	-12.0	-11.3	-10.7
5 TW	-7.3	-7.0	-6.7	-6.3	-6.0	-5.7	-5.3
0	0	0	0	0	0	0	0
10 HW	3.9	3.5	3.1	2.7	2.3	1.9	1.5
20 HW	7.8	7.0	6.2	5.4	4.6	3.8	3.0
30 HW	11.7	10.5	9.3	8.1	6.9	5.7	4.5
40 HW	15.6	14.0	12.4	10.8	9.2	7.6	6.0

With engine bleed for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 1100 kg.
With engine and wing anti-ice on, decrease weight by 1900 kg.

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	8300	4900	1200
290	10000	6700	3200
280	11700	8900	5400
270	13400	10800	7800
260	15100	12500	10000
250	16900	14300	11800
240	18700	16100	13600
230	20500	18000	15500
220	22000	19900	17400
210	23600	21600	19500
200	25100	23400	21300
190	26200	25100	23100
180	27200	26100	25000
170	28400	27200	26100
160	29500	28400	27300
150	30800	29600	28600
140	32800	30900	29900

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
329	292	261	236	216	200	187	175	165	156	148
497	441	393	356	326	300	281	263	247	234	222
663	589	526	476	435	400	374	351	330	312	296
828	736	657	595	544	500	468	438	412	389	370
992	882	788	714	653	600	561	526	495	468	444
1155	1028	918	832	762	700	655	614	578	546	519
1317	1172	1048	950	870	800	748	702	661	625	593
1478	1317	1178	1068	978	899	841	790	743	702	667
1638	1461	1308	1186	1086	999	935	877	826	781	742
1797	1603	1437	1304	1194	1100	1029	966	910	860	818
1955	1746	1565	1421	1303	1200	1124	1055	993	939	893
2112	1887	1693	1538	1410	1300	1218	1143	1077	1018	968
2269	2028	1821	1655	1519	1400	1312	1232	1160	1097	1043
2426	2170	1950	1773	1627	1500	1406	1320	1244	1177	1119
2582	2311	2078	1890	1736	1600	1500	1409	1328	1256	1194
2736	2451	2205	2007	1843	1700	1594	1497	1411	1335	1269
2890	2591	2332	2124	1951	1800	1688	1586	1495	1415	1345
3043	2730	2459	2240	2059	1900	1782	1675	1579	1494	1421
3196	2868	2585	2356	2166	2000	1876	1764	1663	1574	1497
3348	3007	2711	2472	2274	2100	1970	1853	1747	1654	1573
3499	3144	2837	2588	2382	2200	2065	1942	1831	1734	1649
3650	3281	2962	2704	2489	2300	2159	2031	1916	1814	1725
3800	3418	3087	2819	2596	2400	2253	2120	2000	1894	1801
3949	3555	3213	2935	2704	2500	2347	2208	2083	1973	1877
4098	3691	3338	3050	2811	2600	2440	2296	2167	2053	1953
4247	3827	3462	3166	2918	2700	2534	2385	2251	2133	2029

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.5	0:52	7.2	0:50	6.9	0:48	6.7	0:47	6.6	0:46
300	11.1	1:16	10.6	1:13	10.1	1:10	9.7	1:07	9.5	1:05
400	14.8	1:40	14.0	1:35	13.3	1:31	12.7	1:27	12.3	1:24
500	18.5	2:03	17.5	1:58	16.6	1:52	15.8	1:47	15.2	1:43
600	22.2	2:27	20.9	2:20	19.8	2:13	18.8	2:07	18.1	2:02
700	26.0	2:50	24.5	2:42	23.1	2:33	22.0	2:26	21.1	2:20
800	29.8	3:13	28.0	3:03	26.4	2:54	25.1	2:46	24.0	2:38
900	33.7	3:36	31.7	3:25	29.8	3:14	28.2	3:05		
1000	37.5	3:59	35.3	3:46	33.2	3:34	31.4	3:24		
1100	41.5	4:21	39.0	4:07	36.7	3:55	34.7	3:44		
1200	45.4	4:43	42.7	4:28	40.2	4:15	38.0	4:03		
1300	49.5	5:05	46.5	4:49	43.7	4:35	41.3	4:22		
1400	53.5	5:27	50.3	5:10	47.2	4:54	44.6	4:40		
1500	57.7	5:49	54.1	5:31	50.8	5:14	48.0	4:59		
1600	61.8	6:10	58.0	5:51	54.5	5:33	51.4	5:18		
1700	66.1	6:31	61.9	6:11	58.1	5:53				
1800	70.3	6:53	65.9	6:31	61.8	6:12				
1900	74.6	7:13	69.9	6:51	65.6	6:31				
2000	78.9	7:34	73.9	7:11	69.3	6:50				

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.7	1.4
15	-1.8	-0.9	0.0	1.0	2.1
20	-2.4	-1.2	0.0	1.4	2.8
25	-3.0	-1.5	0.0	1.7	3.4
30	-3.6	-1.8	0.0	2.0	4.1
35	-4.2	-2.1	0.0	2.4	4.9
40	-4.8	-2.4	0.0	2.7	5.6
45	-5.4	-2.7	0.0	3.0	6.3
50	-6.0	-3.0	0.0	3.4	7.1
55	-6.6	-3.3	0.0	3.7	7.9
60	-7.2	-3.6	0.0	4.1	8.6
65	-7.8	-3.9	0.0	4.4	9.4
70	-8.4	-4.2	0.0	4.8	10.3
75	-9.1	-4.6	0.0	5.2	11.1

Based on VREF30+80 climb, LRC, and VREF30+80 descent.

GEAR DOWN

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
103	85	72	63	56	50	45	41	38	35	33
176	152	135	121	109	100	92	85	79	74	70
249	220	197	178	163	150	139	129	121	114	107
321	286	258	235	216	200	186	174	163	154	145
392	352	320	292	270	250	233	218	205	194	183
463	418	380	349	323	300	280	263	248	234	222
534	483	441	406	376	350	327	308	290	274	260
606	549	502	463	429	400	375	352	332	315	299
678	615	564	520	482	450	422	397	375	355	337
751	682	625	577	536	500	469	441	417	395	375

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.8	2.0	2.2	2.3	2.5	0:15
	ALT (FT)	14000	12000	10000	10000	8000	
100	FUEL (1000 KG)	3.2	3.5	3.8	4.1	4.4	0:26
	ALT (FT)	24000	22000	20000	18000	16000	
150	FUEL (1000 KG)	4.4	4.8	5.2	5.7	6.2	0:36
	ALT (FT)	30000	26000	24000	22000	20000	
200	FUEL (1000 KG)	5.5	6.1	6.6	7.3	7.9	0:46
	ALT (FT)	30000	28000	26000	24000	20000	
250	FUEL (1000 KG)	6.6	7.3	8.1	8.8	9.6	0:56
	ALT (FT)	30000	28000	26000	24000	20000	
300	FUEL (1000 KG)	7.8	8.6	9.5	10.4	11.4	1:05
	ALT (FT)	30000	28000	26000	24000	20000	
350	FUEL (1000 KG)	8.9	9.9	10.9	12.1	13.2	1:15
	ALT (FT)	30000	28000	26000	22000	20000	
400	FUEL (1000 KG)	10.1	11.2	12.3	13.7	14.9	1:24
	ALT (FT)	30000	28000	26000	22000	20000	
450	FUEL (1000 KG)	11.3	12.5	13.8	15.3	16.7	1:34
	ALT (FT)	30000	28000	26000	22000	20000	
500	FUEL (1000 KG)	12.4	13.8	15.2	17.0	18.9	1:44
	ALT (FT)	30000	28000	26000	22000	18000	

GEAR DOWN

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
300	14300	14300	14340				
280	13310	13310	13320	13430			
260	12380	12360	12340	12400			
240	11500	11460	11430	11430	11560		
220	10650	10590	10550	10520	10570		
200	10080	9750	9690	9660	9660	9790	
180	9270	8950	8870	8840	8810	8850	
160	8480	8370	8060	8020	7980	7980	
140	7690	7590	7280	7340	7310	7150	7200

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	13660	13660	13660		
280	12730	12720	12700	12770	
260	11830	11800	11780	11810	
240	10970	10910	10890	10880	10970
220	10120	10040	10000	9980	10020
200	9520	9200	9130	9110	9110
180	8690	8600	8290	8260	8240
160	7860	7780	7470	7540	7520
140	7180	7110	6990	6730	6700

These tables include 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
17	1483		
16	153.7	146.2	
15	158.8	151.1	
14	164.2	156.2	148.1
13	169.7	161.5	153.1
12	175.3	166.8	158.1
11	179.8	171.8	163.5
10	184.4	176.9	169.0
9	189.6	182.0	174.1
8	194.9	187.2	179.1
7	200.3	192.5	184.3
6	205.9	198.0	189.7
5	211.6	203.5	195.2
4	215.0	206.7	198.0
3	218.3	209.6	200.7
2	221.2	212.2	203.1

Based on max continuous thrust limits with anti-ice off.
With engine anti-ice on, decrease level off weight by 3900 kg.
With engine and wing anti-ice on, decrease level off weight by 5100 kg.

Intentionally
Blank

Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, and Obstacle Limit Weights as determined from the following tables. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

Field Limit Weight - Slope and Wind Corrections

These tables provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction table with slope corrected field length and wind component to determine the slope and wind corrected field length.

Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude with “Slope and Wind Corrected Field Length” determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3500 kg and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 7400 kg and the V1 associated with the reduced weight by two knots. If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance corrected for wind and slope exceeds approximately 1490m for one brake deactivated or 1560m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability at two center of gravity positions: 7.5% MAC (FMC default) for use when no center of gravity is entered on the PERF INIT page, and 30% MAC (typical mid cruise center of gravity) for use when 30% MAC is entered. Crews may interpolate between these values to determine the airplane's capability at other specific center of gravity positions. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time Table with air distance from the Ground to Air Miles Conversion Table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment Table with the Reference Fuel and the planned landing weight to obtain fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system) or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes".

This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 30.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

Gear Down

This section provides flight planning data for revenue operation with gear down.

Takeoff/Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to determine Takeoff Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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777-200ER TRENT892 KG FAA

Takeoff Field Corrections

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1220	1220	1210	1210	1200	1180	1150	1130	1100
1400	1450	1440	1420	1410	1400	1370	1330	1300	1270
1600	1670	1660	1640	1620	1600	1560	1520	1480	1430
1800	1900	1880	1850	1830	1800	1750	1700	1650	1600
2000	2120	2090	2060	2030	2000	1940	1880	1820	1760
2200	2340	2310	2270	2240	2200	2130	2060	2000	1930
2400	2560	2520	2480	2440	2400	2320	2250	2170	2090
2600	2780	2740	2690	2650	2600	2510	2430	2340	2260
2800	3000	2950	2900	2850	2800	2710	2610	2520	2420
3000	3220	3170	3110	3060	3000	2890	2790	2680	2580
3200	3440	3380	3320	3260	3200	3080	2970	2850	2730
3400	3660	3600	3530	3470	3400	3270	3140	3020	2890
3600	3880	3810	3740	3670	3600	3460	3320	3180	3040
3800	4100	4030	3950	3880	3800	3650	3500	3350	3200
4000	4320	4240	4160	4080	4000	3840	3680	3520	3360
4200	4540	4460	4370	4290	4200	4030	3860	3680	3510
4400	4760	4670	4580	4490	4400	4220	4030	3850	3670
4600	4980	4890	4790	4700	4600	4410	4210	4020	3820
4800	5200	5100	5000	4900	4800	4600	4390	4190	3980
5000	5420	5320	5210	5110	5000	4780	4570	4350	4140

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	840	960	1080	1200	1270	1350	1440	1530
1400	1000	1140	1270	1400	1480	1570	1660	1760
1600	1170	1310	1460	1600	1690	1780	1880	1980
1800	1340	1490	1650	1800	1900	2000	2100	2210
2000	1510	1670	1840	2000	2100	2210	2320	2440
2200	1680	1850	2030	2200	2310	2430	2540	2660
2400	1850	2030	2220	2400	2520	2640	2770	2890
2600	2010	2210	2400	2600	2730	2860	2990	3120
2800	2180	2390	2590	2800	2930	3070	3210	3350
3000	2350	2570	2780	3000	3140	3290	3430	3570
3200	2520	2750	2970	3200	3350	3500	3650	3800
3400	2690	2930	3160	3400	3560	3710	3870	4030
3600	2860	3100	3350	3600	3770	3930	4090	4250
3800	3030	3280	3540	3800	3970	4140	4310	4480
4000	3190	3460	3730	4000	4180	4360	4530	4710
4200	3360	3640	3920	4200	4390	4570	4750	4930
4400	3530	3820	4110	4400	4600	4790	4980	5160
4600	3700	4000	4300	4600	4800	5000	5200	5390
4800	3870	4180	4490	4800	5010	5220	5420	5610
5000	4040	4360	4680	5000	5220	5430	5640	5840

Takeoff Field & Climb Limit Weights

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT										
°C	-40	14	18	22	23	25	27	29	30	40	50
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	224.7	204.2	202.9	201.6	201.3	200.6	200.0	199.4	198.7	189.0	175.5
1600	235.2	213.9	212.6	211.3	210.9	210.3	209.6	209.0	208.3	198.2	184.2
1800	249.8	227.5	226.1	224.7	224.3	223.7	223.0	222.3	221.6	211.0	196.4
2000	263.2	240.0	238.5	237.1	236.7	236.0	235.3	234.6	233.9	222.8	207.7
2200	275.7	251.7	250.2	248.7	248.3	247.6	246.9	246.2	245.3	233.9	218.2
2400	287.6	262.8	261.2	259.7	259.3	258.5	257.8	257.0	256.2	244.4	228.2
2600	298.9	273.4	271.7	270.1	269.7	268.9	268.2	267.4	266.5	254.4	237.6
2800	309.8	283.5	281.8	280.2	279.8	279.0	278.2	277.4	276.5	264.0	246.7
3000	317.5	292.6	290.9	289.2	288.8	287.9	287.1	286.3	285.4	272.5	254.7
3200	317.5	301.1	299.3	297.6	297.1	296.3	295.5	294.6	293.7	280.5	262.3
3400	317.5	309.2	307.3	305.6	305.1	304.3	303.4	302.6	301.6	288.1	269.5
3600	317.5	316.9	315.0	313.2	312.8	311.9	311.0	310.1	309.2	295.4	276.4
3800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.3	316.3	302.3	283.0
4000	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	309.0	289.3
4200	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	315.3	295.3
4400	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	301.1
4600	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	306.6
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	311.9
CLIMB LIMIT WT (1000 KG)	294.2	293.1	293.0	292.9	292.9	292.8	292.8	292.8	291.8	271.9	242.4

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT										
°C	-40	14	18	22	23	25	27	29	30	40	50
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	211.3	191.9	190.7	189.5	189.2	188.6	187.3	185.7	184.9	175.4	162.9
1600	221.4	201.2	199.9	198.7	198.4	197.7	196.4	194.8	193.9	184.1	171.1
1800	235.3	214.2	212.8	211.5	211.2	210.6	209.2	207.5	206.6	196.2	182.7
2000	248.1	226.2	224.8	223.4	223.1	222.4	221.0	219.2	218.3	207.5	193.4
2200	260.1	237.4	236.0	234.5	234.2	233.5	232.0	230.1	229.2	218.0	203.4
2400	271.5	248.0	246.5	245.0	244.7	243.9	242.4	240.5	239.5	228.0	212.9
2600	282.3	258.1	256.5	255.0	254.6	253.9	252.3	250.3	249.3	237.4	221.9
2800	292.7	267.8	266.2	264.6	264.2	263.5	261.8	259.8	258.7	246.5	230.5
3000	302.1	276.4	274.8	273.1	272.7	272.0	270.3	268.2	267.1	254.5	238.0
3200	310.8	284.5	282.8	281.2	280.8	279.9	278.2	276.1	275.0	262.1	245.2
3400	317.5	292.2	290.5	288.8	288.4	287.6	285.8	283.6	282.5	269.3	252.0
3600	317.5	299.6	297.8	296.1	295.7	294.9	293.1	290.8	289.7	276.2	258.6
3800	317.5	306.6	304.8	303.1	302.6	301.8	300.0	297.7	296.5	282.8	264.9
4000	317.5	313.3	311.5	309.7	309.2	308.4	306.5	304.2	303.0	289.1	270.8
4200	317.5	317.5	317.5	316.0	315.6	314.7	312.8	310.5	309.3	295.1	276.6
4400	317.5	317.5	317.5	317.5	317.5	317.5	317.5	316.5	315.3	300.9	282.1
4600	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	306.4	287.3
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	311.7	292.3
CLIMB LIMIT WT (1000 KG)	278.2	277.1	277.1	277.0	277.0	276.9	274.8	271.7	270.1	250.9	224.7

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.
With engine anti-ice on, decrease field limit weight by 30 kg.
With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Field & Climb Limit Weights

Flaps 15

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT										
°C	-40	14	18	22	23	25	27	29	30	40	50
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	197.3	179.1	177.9	176.4	175.8	174.4	173.0	171.3	170.5	161.3	151.6
1600	206.8	187.9	186.7	185.1	184.4	183.0	181.6	179.9	179.0	169.4	159.3
1800	220.1	200.3	199.0	197.4	196.6	195.1	193.6	191.8	190.9	180.9	170.4
2000	232.3	211.7	210.4	208.7	207.9	206.4	204.8	202.9	202.0	191.5	180.6
2200	243.7	222.4	221.0	219.3	218.5	216.9	215.3	213.3	212.3	201.5	190.2
2400	254.5	232.5	231.1	229.2	228.4	226.8	225.1	223.1	222.1	210.9	199.2
2600	264.8	242.1	240.6	238.7	237.9	236.2	234.5	232.4	231.3	219.8	207.8
2800	274.7	251.3	249.8	247.8	247.0	245.2	243.5	241.3	240.2	228.4	215.9
3000	283.5	259.4	257.9	255.9	255.0	253.2	251.4	249.2	248.0	235.8	223.0
3200	291.8	267.1	265.5	263.5	262.6	260.7	258.9	256.6	255.4	242.9	229.8
3400	299.7	274.4	272.8	270.8	269.8	267.9	266.0	263.7	262.5	249.8	236.4
3600	307.2	281.5	279.8	277.7	276.8	274.8	272.9	270.5	269.3	256.3	242.6
3800	314.3	288.1	286.5	284.3	283.3	281.4	279.4	277.0	275.8	262.5	248.6
4000	317.5	294.5	292.8	290.6	289.6	287.6	285.6	283.2	281.9	268.4	254.3
4200	317.5	300.6	298.9	296.7	295.7	293.6	291.6	289.1	287.9	274.1	259.8
4400	317.5	306.5	304.7	302.5	301.4	299.4	297.3	294.8	293.5	279.6	265.0
4600	317.5	312.1	310.3	308.0	307.0	304.9	302.8	300.2	298.9	284.8	270.0
4800	317.5	317.4	315.6	313.3	312.2	310.1	308.0	305.4	304.1	289.8	274.8
CLIMB LIMIT WT (1000 KG)	259.6	258.6	258.6	257.6	256.5	254.1	251.5	248.3	246.7	228.8	209.8

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT										
°C	-40	14	18	22	23	25	27	29	30	40	50
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	183.9	166.8	165.5	163.7	163.3	161.8	160.3	158.7	157.9	149.4	140.1
1600	192.9	175.1	173.8	171.9	171.5	170.0	168.4	166.7	165.9	157.1	147.4
1800	205.5	186.9	185.5	183.5	183.1	181.5	179.8	178.1	177.2	168.0	157.9
2000	217.1	197.8	196.3	194.3	193.8	192.1	190.4	188.6	187.7	178.2	167.6
2200	228.0	208.0	206.4	204.4	203.9	202.1	200.3	198.5	197.5	187.7	176.7
2400	238.3	217.6	216.0	213.9	213.4	211.6	209.7	207.8	206.8	196.6	185.3
2600	248.0	226.7	225.1	222.9	222.4	220.5	218.6	216.6	215.6	205.1	193.4
2800	257.4	235.5	233.8	231.5	231.0	229.1	227.1	225.1	224.0	213.2	201.2
3000	265.8	243.1	241.4	239.1	238.5	236.5	234.5	232.4	231.3	220.2	207.8
3200	273.6	250.4	248.6	246.3	245.7	243.7	241.6	239.5	238.4	226.9	214.3
3400	281.1	257.4	255.6	253.2	252.6	250.5	248.4	246.2	245.1	233.4	220.5
3600	288.2	264.1	262.2	259.8	259.2	257.1	254.9	252.7	251.5	239.6	226.4
3800	295.0	270.5	268.6	266.0	265.4	263.3	261.1	258.8	257.7	245.5	232.1
4000	301.5	276.5	274.6	272.0	271.4	269.2	267.0	264.7	263.5	251.2	237.5
4200	307.7	282.4	280.4	277.8	277.2	275.0	272.7	270.3	269.1	256.6	242.7
4400	313.7	287.9	285.9	283.3	282.7	280.4	278.1	275.7	274.5	261.8	247.7
4600	317.5	293.3	291.2	288.5	287.9	285.6	283.3	280.9	279.6	266.7	252.4
4800	317.5	298.3	296.3	293.6	292.9	290.6	288.2	285.8	284.5	271.4	256.9
CLIMB LIMIT WT (1000 KG)	242.2	241.4	240.8	238.8	238.3	235.6	232.7	229.7	228.2	212.1	195.7

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.
With engine anti-ice on, decrease field limit weight by 30 kg.
With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Field & Climb Limit Weights
Flaps 15
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	23	25	27	29	30	40	50
	°F	-40	57	64	72	73	77	81	84	86	104	122
1470		171.7	155.5	153.4	151.4	150.9	149.7	148.2	146.6	145.8	137.2	128.4
1600		180.2	163.4	161.2	159.1	158.6	157.4	155.9	154.2	153.3	144.4	135.2
1800		192.2	174.6	172.3	170.1	169.6	168.3	166.7	164.9	164.0	154.7	145.1
2000		203.3	185.0	182.6	180.3	179.8	178.5	176.8	174.9	174.0	164.3	154.4
2200		213.7	194.7	192.2	189.9	189.3	188.0	186.3	184.3	183.4	173.3	163.0
2400		223.5	203.9	201.3	198.9	198.3	196.9	195.1	193.1	192.2	181.8	171.1
2600		232.8	212.6	210.0	207.5	206.9	205.4	203.6	201.5	200.5	189.8	178.8
2800		241.8	220.9	218.2	215.6	215.0	213.5	211.6	209.5	208.4	197.4	186.1
3000		249.6	228.2	225.4	222.7	222.1	220.5	218.6	216.4	215.3	203.9	192.3
3200		257.1	235.1	232.2	229.5	228.9	227.3	225.3	223.1	221.9	210.3	198.4
3400		264.2	241.8	238.8	236.0	235.4	233.8	231.7	229.5	228.3	216.4	204.2
3600		271.0	248.1	245.1	242.3	241.6	240.0	237.9	235.6	234.4	222.3	209.9
3800		277.5	254.2	251.1	248.3	247.6	245.9	243.8	241.4	240.2	227.9	215.2
4000		283.7	260.0	256.9	254.0	253.3	251.6	249.4	247.0	245.8	233.2	220.4
4200		289.6	265.6	262.4	259.4	258.7	257.0	254.8	252.3	251.1	238.4	225.3
4400		295.3	270.9	267.7	264.6	263.9	262.2	260.0	257.5	256.2	243.3	230.0
4600		300.8	276.0	272.7	269.6	268.9	267.2	264.9	262.4	261.1	248.0	234.5
4800		305.9	280.8	277.5	274.4	273.7	271.9	269.6	267.0	265.7	252.4	238.8
CLIMB LIMIT WT (1000 KG)		227.3	226.1	223.2	220.5	219.8	217.8	215.0	212.2	210.8	196.0	180.9

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.
With engine anti-ice on, decrease field limit weight by 30 kg.
With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Sea Level, 29°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	254.2	275.9	292.8	303.4							
20	235.1	254.1	269.9	283.1	293.4	300.1	305.5	310.0			
40	216.9	234.7	249.7	262.7	273.7	282.8	290.1	295.4	299.6	303.2	306.3
60	202.3	220.3	235.5	248.3	259.0	268.1	276.0	282.6	288.3	292.7	296.2
80	190.4	208.9	224.0	236.6	247.3	256.4	264.2	271.1	277.2	282.4	286.9
100	180.1	198.9	214.1	226.6	237.2	246.4	254.4	261.3	267.5	273.0	277.9
120	170.1	190.2	205.2	217.8	228.5	237.7	245.8	252.8	259.1	264.6	269.7
140	168.4	182.3	197.2	209.8	220.6	229.9	238.0	245.2	251.6	257.2	262.3
160	161.3	174.7	190.0	202.6	213.4	222.7	231.0	238.2	244.7	250.5	255.7
180	154.8	167.3	183.5	195.9	206.7	216.2	224.5	231.8	238.4	244.2	249.5
200		166.4	177.2	189.8	200.6	210.1	218.4	225.8	232.5	238.4	243.8
220		160.7	171.4	184.2	194.9	204.4	212.8	220.2	226.9	233.0	238.5
240		155.5	165.4	178.9	189.6	199.0	207.4	215.0	221.7	227.9	233.4
260			164.9	173.9	184.6	194.0	202.4	210.0	216.8	223.0	228.6
280			160.3	168.7	180.1	189.3	197.7	205.3	212.2	218.4	224.0
300			155.9	166.5	175.7	184.9	193.3	200.8	207.7	214.0	219.7

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
29 & BELOW	0	0	0	0	0	0	0	0
30	-1.0	-1.2	-1.3	-1.4	-1.6	-1.7	-1.8	-2.0
32	-3.1	-3.5	-3.9	-4.3	-4.7	-5.1	-5.5	-5.9
34	-5.1	-5.8	-6.5	-7.2	-7.9	-8.5	-9.2	-9.9
36	-7.2	-8.1	-9.1	-10.0	-11.0	-11.9	-12.9	-13.9
38	-9.2	-10.5	-11.7	-12.9	-14.1	-15.4	-16.6	-17.8
40	-11.3	-12.8	-14.3	-15.8	-17.3	-18.8	-20.3	-21.8
42	-14.3	-16.3	-18.3	-20.2	-22.2	-24.2	-26.2	-28.1
44	-17.3	-19.8	-22.2	-24.7	-27.2	-29.6	-32.1	-34.5
46	-20.3	-23.3	-26.2	-29.2	-32.1	-35.0	-38.0	-40.9
48	-23.4	-26.8	-30.2	-33.6	-37.0	-40.4	-43.9	-47.3
50	-26.4	-30.3	-34.2	-38.1	-42.0	-45.9	-49.8	-53.6

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-6.0	-6.7	-7.3	-8.0	-8.7	-9.3	-10.0	-10.7
2000	-12.7	-14.1	-15.6	-17.0	-18.5	-19.9	-21.4	-22.8
3000	-19.4	-21.7	-24.0	-26.3	-28.6	-30.9	-33.1	-35.4

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
15 TW	-20.1	-20.7	-21.2	-21.8	-22.4	-22.9	-23.5	-24.1
10 TW	-13.4	-13.8	-14.2	-14.5	-14.9	-15.3	-15.7	-16.1
5 TW	-6.7	-6.9	-7.1	-7.3	-7.5	-7.6	-7.8	-8.0
0	0	0	0	0	0	0	0	0
10 HW	4.5	4.1	3.7	3.2	2.8	2.4	2.0	1.6
20 HW	9.0	8.2	7.3	6.5	5.7	4.8	4.0	3.2
30 HW	12.5	11.4	10.3	9.2	8.2	7.1	6.0	4.9
40 HW	16.0	14.7	13.3	12.0	10.7	9.3	8.0	6.7

With engine bleed for packs off, increase weight by 300 kg.
With engine and wing anti-ice on, decrease weight by 1400 kg.

Brake Energy Limits VMBE

Maximum Brake Energy Speed

OAT (°C)	REFERENCE VMBE (KIAS)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	198	190				
50	198	191	184			
46	199	191	185	178		
42	200	192	185	179	172	
38	200	193	186	180	173	167
34	202	194	187	180	174	168
30	203	194	188	181	175	169
26	205	196	189	182	176	170
22	207	198	190	184	177	171
18	208	199	192	185	178	172
14	210	201	194	186	180	173
10	210	203	195	188	181	174
6	210	205	197	190	183	176
2	210	207	199	191	184	177
-2	210	209	201	193	186	179
-6	210	210	202	195	188	180
-10	210	210	204	197	189	182

Weight Adjusted VMBE

WEIGHT (1000 KG)	REFERENCE VMBE (KIAS)										
	160	165	170	175	180	185	190	195	200	205	210
160	205	210	210	210	210	210	210	210	210	210	210
170	196	202	209	210	210	210	210	210	210	210	210
180	188	194	201	207	210	210	210	210	210	210	210
190	182	188	194	200	206	210	210	210	210	210	210
200	177	183	188	194	200	206	210	210	210	210	210
210	172	178	183	189	194	200	205	210	210	210	210
220	168	173	178	184	189	195	200	205	210	210	210
230	164	169	174	179	184	190	195	200	205	210	210
240	160	165	170	175	180	185	190	195	200	205	210
250	156	161	166	171	176	181	185	190	195	200	205
260	153	158	162	167	172	177	181	186	191	195	200
270	150	155	159	164	168	173	177	182	187	191	196
280	147	152	156	161	165	169	174	178	183	187	192
290	145	149	153	158	162	166	171	175	179	183	188
300	142	147	151	155	159	163	167	172	176	180	184
310	140	144	148	152	156	161	165	169	173	177	181

Increase VMBE by 3 knots per 1% uphill runway slope. Decrease VMBE by 5 knots per 1% downhill runway slope.
Increase VMBE by 5 knots per 10 knots headwind. Decrease VMBE by 21 knots per 10 knots tailwind.
Decrease VMBE by 10 knots for one brake deactivated and 20 knots for two brakes deactivated.
Decrease brake release weight by 1600 kg for each knot V1 exceeds VMBE.
Determine normal V1, VR, V2 speeds for lower brake release weight.

Takeoff Speeds
Flaps 15
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 15		
	V1	VR	V2
300	157	162	168
290	153	159	165
280	150	156	163
270	147	153	160
260	144	150	157
250	140	146	154
240	137	143	152
230	133	139	149
220	129	136	146
210	126	132	143
200	121	129	140
190	117	125	136
180	112	121	133
170	107	117	130
160	103	113	126
150	98	108	123
140	93	104	119

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	8	10	12	3	4	5	6	-2	-2	-3	-3						
50	122	4	5	7	9	11	13	2	2	3	4	5	6	-1	-1	-2	-2	-3	-3
40	104	1	2	4	7	8	10	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	2	5	7	9	0	0	1	2	4	5	0	0	-1	-1	-2	-2
20	68	0	0	1	3	6	7	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
300	-5	-2	0	2	4	-2	-1	-1	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
180	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
140	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2

***V1 not to exceed VR**

Takeoff Speeds
Flaps 15
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	MinVR	V1 (MCG)	MinVR	V1 (MCG)	MinVR	V1 (MCG)	MinVR	V1 (MCG)	MinVR	V1 (MCG)	MinVR
60	140	113	114	109	111	108	109	106	108				
50	122	115	116	112	114	108	110	106	108	104	106	101	104
40	104	121	122	118	119	114	115	109	110	105	107	101	104
30	86	123	124	122	123	118	119	113	114	108	110	104	106
20	68	123	124	123	123	119	120	115	117	111	113	107	109
-60	-76	124	124	124	124	120	121	116	117	112	113	109	110

Intentionally
Blank

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	-1	33500*	33500*	33500*	33400	31900
290	31100	-3	34300*	34300*	34300*	34100	32700
280	31800	-5	35200*	35200*	35200*	34900	33400
270	32600	-7	36100*	36100*	36100*	35600	34200
260	33400	-8	36800*	36800*	36800*	36400	35000
250	34200	-10	37600*	37600*	37600*	37200	35800
240	35100	-12	38400*	38400*	38400*	38100	36600
230	36000	-14	39300*	39300*	39300*	39000	37500
220	36900	-14	40200*	40200*	40200*	39900	38500
210	37900	-14	41100*	41100*	41100*	40900	39400
200	38900	-14	42100*	42100*	42100*	41900	40400
190	40000	-14	43000	43000	43000	42900	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	4	32500*	32500*	32500*	32500*	31900
290	31100	3	33400*	33400*	33400*	33400*	32700
280	31800	1	34300*	34300*	34300*	34300*	33400
270	32600	-1	35200*	35200*	35200*	35200*	34200
260	33400	-3	36100*	36100*	36100*	36100*	35000
250	34200	-5	36900*	36900*	36900*	36900*	35800
240	35100	-7	37700*	37700*	37700*	37700*	36600
230	36000	-9	38600*	38600*	38600*	38600*	37500
220	36900	-9	39500*	39500*	39500*	39500*	38500
210	37900	-9	40400*	40400*	40400*	40400*	39400
200	38900	-9	41400*	41400*	41400*	41400*	40400
190	40000	-9	42400*	42400*	42400*	42400*	41500
180	41100	-9	43000	43000	43000	43000	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	10	31100*	31100*	31100*	31100*	31100*
290	31100	8	32100*	32100*	32100*	32100*	32100*
280	31800	7	33100*	33100*	33100*	33100*	33100*
270	32600	5	34100*	34100*	34100*	34100*	34100*
260	33400	3	35100*	35100*	35100*	35100*	35000
250	34200	1	36100*	36100*	36100*	36100*	35800
240	35100	-1	36800*	36800*	36800*	36800*	36600
230	36000	-3	37700*	37700*	37700*	37700*	37500
220	36900	-3	38600*	38600*	38600*	38600*	38500
210	37900	-3	39500*	39500*	39500*	39500*	39400
200	38900	-3	40500*	40500*	40500*	40500*	40400
190	40000	-3	41500*	41500*	41500*	41500*	41500
180	41100	-3	42600*	42600*	42600*	42600*	42600
170	42300	-3	43000	43000	43000	43000	43000
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1051	990	934	885	840	800	767	736	707	680	656
1571	1480	1398	1325	1260	1200	1151	1105	1062	1023	987
2089	1971	1863	1766	1680	1600	1535	1474	1417	1366	1318
2606	2459	2325	2206	2099	2000	1919	1843	1773	1708	1649
3121	2946	2787	2645	2517	2400	2303	2213	2129	2051	1980
3635	3433	3248	3084	2936	2800	2688	2583	2485	2394	2311
4147	3918	3709	3523	3355	3200	3072	2952	2840	2737	2643
4657	4402	4169	3961	3773	3600	3456	3321	3196	3080	2974
5166	4885	4628	4398	4191	4000	3839	3690	3551	3423	3305
5674	5367	5086	4836	4609	4400	4224	4059	3907	3766	3636
6181	5849	5545	5273	5027	4800	4608	4429	4262	4108	3967
6686	6329	6002	5709	5444	5200	4992	4798	4617	4451	4298
7190	6809	6459	6146	5862	5600	5376	5167	4973	4794	4629
7693	7288	6915	6582	6279	6000	5761	5537	5329	5137	4960
8196	7766	7371	7017	6696	6400	6145	5906	5684	5479	5291
8698	8244	7827	7453	7113	6800	6528	6275	6039	5822	5622
9200	8721	8282	7888	7530	7200	6913	6644	6395	6164	5953
9702	9199	8738	8323	7947	7600	7297	7014	6751	6508	6285
10204	9677	9194	8759	8365	8000	7681	7383	7106	6850	6615

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
800	12.4	2:00	12.1	1:58	11.9	1:56	11.7	1:54	11.5	1:52
1200	17.9	2:56	17.4	2:52	17.1	2:49	16.8	2:45	16.5	2:42
1600	23.6	3:51	23.0	3:46	22.5	3:41	22.0	3:36	21.6	3:32
2000	29.4	4:45	28.6	4:39	27.9	4:32	27.3	4:27	26.8	4:22
2400	35.2	5:39	34.2	5:31	33.4	5:24	32.7	5:17	32.1	5:12
2800	41.3	6:32	40.1	6:23	39.1	6:14	38.2	6:07	37.5	6:02
3200	47.4	7:24	46.0	7:14	44.9	7:05	43.8	6:57	43.1	6:52
3600	53.5	8:17	52.0	8:05	50.7	7:55	49.5	7:47	48.7	7:42
4000	59.9	9:08	58.2	8:56	56.7	8:44	55.4	8:36	54.6	8:32
4400	66.3	9:59	64.4	9:46	62.8	9:34	61.4	9:26	60.6	9:22
4800	72.9	10:50	70.8	10:36	68.9	10:23	67.5	10:16	66.8	10:12
5200	79.6	11:40	77.3	11:25	75.3	11:13	73.8	11:05	73.3	11:02
5600	86.4	12:29	83.9	12:14	81.8	12:02	80.3	11:55		
6000	93.3	13:19	90.6	13:03	88.5	12:51	86.9	12:45		
6400	100.4	14:08	97.6	13:52	95.3	13:40	93.8	13:35		
6800	107.6	14:57	104.6	14:41	102.3	14:30	101.0	14:25		
7200	114.9	15:46	111.8	15:30	109.5	15:19	108.4	15:15		
7600	122.4	16:35	119.3	16:19	116.9	16:09				
8000	130.1	17:23	126.8	17:08	124.6	16:58				

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.8	1.6
20	-2.4	-1.1	0.0	1.7	3.6
30	-3.6	-1.8	0.0	2.7	6.0
40	-4.8	-2.4	0.0	3.8	8.7
50	-6.0	-3.0	0.0	5.0	11.7
60	-7.3	-3.7	0.0	6.4	15.0
70	-8.6	-4.3	0.0	7.9	18.7
80	-9.9	-5.0	0.0	9.6	22.8
90	-11.2	-5.7	0.0	11.3	27.1
100	-12.6	-6.4	0.0	13.2	31.9
110	-14.0	-7.1	0.0	15.2	36.9
120	-15.4	-7.8	0.0	17.4	42.3
130	-16.9	-8.6	0.0	19.7	48.0
140	-18.3	-9.3	0.0	22.1	54.1

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
1040	981	928	881	839	800	765	732	703	675	650
1545	1461	1386	1318	1256	1200	1149	1102	1058	1018	981
2050	1941	1843	1754	1673	1600	1533	1471	1414	1361	1312
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643
3060	2900	2757	2627	2508	2400	2301	2209	2125	2047	1974
3564	3380	3214	3063	2925	2800	2685	2579	2481	2390	2306
4069	3859	3670	3499	3343	3200	3069	2948	2837	2733	2637
4573	4339	4127	3935	3760	3600	3453	3318	3192	3076	2968
5078	4818	4584	4371	4177	4000	3837	3687	3548	3419	3300
5582	5297	5040	4807	4595	4400	4221	4056	3904	3763	3631
6086	5776	5497	5243	5012	4800	4605	4426	4260	4106	3963
6590	6256	5953	5679	5429	5200	4990	4795	4616	4449	4294
7094	6735	6410	6115	5846	5600	5374	5165	4972	4792	4626
7598	7214	6867	6551	6264	6000	5758	5534	5328	5136	4957
8103	7693	7323	6987	6681	6400	6142	5904	5683	5479	5289
8607	8173	7780	7423	7098	6800	6526	6273	6039	5822	5620
9111	8652	8237	7859	7515	7200	6910	6643	6395	6165	5952
9616	9131	8693	8296	7933	7600	7294	7012	6751	6508	6283
10121	9611	9150	8732	8350	8000	7678	7381	7107	6852	6614

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG) 140	150	160	170	180	190	200	210	220	TIME (HRS:MIN)
800	9.6	10.1	10.4	11.0	11.5	11.9	12.4	13.0	13.5	1:51
1200	13.6	14.2	14.9	15.7	16.4	17.1	17.9	18.7	19.4	2:41
1600	17.7	18.5	19.5	20.5	21.4	22.4	23.5	24.6	25.4	3:31
2000	21.9	22.9	24.2	25.5	26.6	27.9	29.3	30.6	31.7	4:21
2400	26.1	27.5	28.9	30.5	31.9	33.5	35.1	36.7	38.1	5:11
2800	30.5	32.1	33.8	35.6	37.4	39.2	41.1	42.9	44.7	6:00
3200	35.0	36.8	38.8	40.9	43.0	45.1	47.2	49.4	51.5	6:50
3600	39.5	41.7	43.9	46.4	48.7	51.1	53.5	56.0	58.4	7:40
4000	44.2	46.6	49.2	51.9	54.5	57.2	60.0	62.8	65.5	8:29
4400	49.0	51.7	54.6	57.6	60.5	63.5	66.6	69.8	72.7	9:19
4800	53.9	56.8	60.1	63.5	66.6	70.0	73.5	76.9	80.2	10:09
5200	58.9	62.2	65.7	69.4	72.9	76.6	80.4	84.2	87.8	10:58
5600	64.0	67.7	71.5	75.5	79.3	83.4	87.6	91.6	95.7	11:48
6000	69.2	73.3	77.4	81.7	85.9	90.4	94.9	99.3	103.7	12:37
6400	74.6	79.0	83.4	88.1	92.7	97.5	102.4	107.2		13:27
6800	80.2	84.8	89.6	94.7	99.7	104.8	110.1	115.4		14:17
7200	85.8	90.8	96.0	101.5	106.8	112.3				15:06
7600	91.6	96.9	102.5	108.4	114.1	120.0				15:56
8000	97.5	103.2	109.3	115.5	121.6	127.9				16:46

Based on 310/.84 climb, LRC and .84/310/250 descent.
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
93	79	69	61	55	50	46	42	39	36	34
159	142	129	117	108	100	93	87	82	77	73
224	204	187	173	161	150	141	133	125	119	113
287	264	245	228	213	200	189	178	169	161	153
349	324	301	282	265	250	237	224	214	204	195
411	382	358	336	317	300	285	271	258	247	236
472	441	414	390	369	350	333	317	303	290	278
534	500	471	445	421	400	381	364	348	333	320
597	560	528	499	473	450	429	410	392	376	361
661	621	586	554	526	500	477	456	436	418	402

Trip Fuel and Time Required

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	0:14
	ALT (FT)	10000	10000	9000	8000	8000	
100	FUEL (1000 KG)	2.3	2.4	2.6	2.7	2.9	0:22
	ALT (FT)	19000	18000	17000	16000	15000	
150	FUEL (1000 KG)	3.0	3.2	3.4	3.6	3.8	0:30
	ALT (FT)	27000	25000	24000	22000	21000	
200	FUEL (1000 KG)	3.6	3.9	4.1	4.4	4.6	0:36
	ALT (FT)	34000	31000	29000	28000	26000	
250	FUEL (1000 KG)	4.2	4.5	4.8	5.1	5.4	0:43
	ALT (FT)	39000	36000	34000	32000	30000	
300	FUEL (1000 KG)	4.7	5.0	5.4	5.8	6.2	0:48
	ALT (FT)	43000	40000	37000	35000	33000	
350	FUEL (1000 KG)	5.1	5.6	6.0	6.5	6.9	0:54
	ALT (FT)	43000	42000	39000	36000	34000	
400	FUEL (1000 KG)	5.6	6.1	6.6	7.1	7.6	1:00
	ALT (FT)	43000	42000	39000	36000	34000	
450	FUEL (1000 KG)	6.1	6.6	7.2	7.8	8.3	1:06
	ALT (FT)	43000	42000	39000	36000	34000	
500	FUEL (1000 KG)	6.6	7.2	7.8	8.4	9.1	1:13
	ALT (FT)	43000	42000	39000	36000	34000	

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	8700	8640	8370	8470	8880	9070	9420			
280	8110	8030	7780	7780	8110	8350	8600	9090		
260	7540	7450	7370	7150	7470	7650	7850	8110		
240	7120	7020	6920	6700	6750	6970	7120	7410		
220	6560	6460	6340	6280	6100	6330	6430	6620	7170	
200	6020	5920	5780	5700	5520	5600	5750	5900	6260	
180	5640	5390	5260	5160	5100	4940	5150	5210	5530	5750
160	5130	5020	4760	4650	4580	4520	4430	4640	4880	5110
140	4660	4530	4390	4160	4070	4010	3880	3950	4190	4340

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	9360	9070	9040	9070	9130
280	8700	8630	8370	8390	8430
260	8070	7980	7710	7710	7870
240	7440	7350	7260	7180	7190
220	6970	6880	6760	6540	6540
200	6360	6270	6160	6070	5900
180	5910	5680	5570	5470	5290
160	5340	5230	5000	4900	4820
140	4800	4670	4550	4340	4250

These tables include 5% additional fuel for holding in a racetrack pattern.

Oxygen Requirements

Passenger Oxygen System - Gaseous

Table 1

NO. OF OCCUPANTS IN PASSENGER CABIN	MINIMUM POST DECOMPRESSION TIME (MINUTES)	PRESSURE ALTITUDE AT DECOMPRESSION (FT)				
		27000	31000	35000	39000	43000
		LITERS REQUIRED				
100	10*	1290	1459	1671	1890	1985
200		2577	2918	3286	3710	3895
300		3866	4377	4901	5530	5805
400		5154	5836	6516	7350	7720
500		6443	7295	8131	9171	9630

***Minimum post decompression time (10 min) approximates direct descent to 10000 ft pressure altitude.**

Table 2

NO. OF OCCUPANTS IN PASSENGER CABIN	ADDITIONAL OXYGEN REQUIRED (LITERS PER MINUTE ABOVE 10000 FT PRESSURE ALTITUDE)										
	INTERMEDIATE PRESSURE ALTITUDE										
	11000*	12000*	13000**	14000**	15000**	16000	17000	18000	19000	21000	25000
100	11	10	29	27	32	115	120	125	140	165	230
200	21	20	57	54	65	230	240	250	280	330	460
300	32	30	86	81	95	345	360	375	420	495	690
400	42	40	114	108	126	460	480	500	560	660	920
500	53	50	143	135	158	575	600	625	700	825	1150

Total oxygen quantity required is:
Direct emergency descent from initial cruise altitude down to 10000 ft (from Table 1) plus level off and cruise at intermediate altitude above 10000 ft if applicable (from Table 2).
***10% of cabin occupants using oxygen.**
****30% of cabin occupants using oxygen.**

Oxygen Requirements

Passenger Oxygen System - Gaseous

Cylinder Volume to Pressure Conversion

Table 3

CYLINDER PRESSURE @21°C(PSI)	OXYGEN CYLINDERS (1000 LITERS)																				
	NUMBER OF 115 CUBIC FOOT BOTTLES INSTALLED																				
	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
100			.1	.1	.1	.1	.2	.2	.2	.2	.3	.3	.3	.3	.4	.4	.4	.4	.5	.5	.5
200	.1	.3	.7	.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3
300	.3	.7	1.4	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.8	5.2	5.5	5.9	6.3	6.7	7.0	7.4	7.8	8.1
400	.5	1.0	2.1	2.7	3.2	3.8	4.3	4.9	5.4	6.0	6.5	7.0	7.6	8.1	8.7	9.2	9.8	10.3	10.9	11.4	12.0
500	.7	1.4	2.8	3.5	4.3	5.0	5.7	6.4	7.1	7.9	8.6	9.3	10.0	10.7	11.5	12.2	12.9	13.6	14.3	15.1	15.8
600	.8	1.7	3.5	4.4	5.3	6.2	7.1	8.0	8.9	9.8	10.7	11.6	12.4	13.3	14.2	15.1	16.0	16.9	17.8	18.7	19.6
700	1.0	2.1	4.2	5.3	6.3	7.4	8.5	9.5	10.6	11.7	12.7	13.8	14.9	15.9	17.0	18.1	19.1	20.2	21.3	22.3	23.4
800	1.2	2.4	4.9	6.1	7.4	8.6	9.9	11.1	12.3	13.6	14.8	16.1	17.3	18.5	19.8	21.0	22.3	23.5	24.7	26.0	27.2
900	1.4	2.8	5.6	7.0	8.4	9.8	11.3	12.7	14.1	15.5	16.9	18.3	19.7	21.1	22.6	24.0	25.4	26.8	28.2	29.6	31.0
1000	1.5	3.1	6.3	7.9	9.5	11.1	12.6	14.2	15.8	17.4	19.0	20.6	22.2	23.7	25.3	26.9	28.5	30.1	31.7	33.3	34.8
1100	1.7	3.5	7.0	8.7	10.5	12.3	14.0	15.8	17.5	19.3	21.1	22.8	24.6	26.3	28.1	29.9	31.6	33.4	35.1	36.9	38.7
1200	1.9	3.8	7.7	9.6	11.5	13.5	15.4	17.3	19.3	21.2	23.1	25.1	27.0	28.9	30.9	32.8	34.7	36.7	38.6	40.5	42.5
1300	2.1	4.2	8.4	10.5	12.6	14.7	16.8	18.9	21.0	23.1	25.2	27.3	29.4	31.5	33.6	35.8	37.9	40.0	42.1	44.2	46.3
1400	2.2	4.5	9.1	11.3	13.6	15.9	18.2	20.5	22.7	25.0	27.3	29.6	31.9	34.1	36.4	38.7	41.0	43.3	45.5	47.8	50.1
1500	2.4	4.9	9.8	12.2	14.7	17.1	19.6	22.0	24.5	26.9	29.4	31.8	34.3	36.7	39.2	41.6	44.1	46.5	49.0	51.5	53.9
1600	2.6	5.2	10.5	13.1	15.7	18.3	21.0	23.6	26.2	28.8	31.5	34.1	36.7	39.3	42.0	44.6	47.2	49.8	52.5	55.1	57.7
1700	2.7	5.5	11.1	13.9	16.7	19.5	22.3	25.1	27.9	30.7	33.5	36.3	39.1	41.9	44.7	47.5	50.3	53.1	55.9	58.7	61.5
1800	2.9	5.9	11.8	14.8	17.8	20.8	23.7	26.7	29.7	32.6	35.6	38.6	41.6	44.5	47.5	50.5	53.5	56.4	59.4	62.4	65.3
1900	3.1	6.2	12.5	15.7	18.8	22.0	25.1	28.3	31.4	34.6	37.7	40.8	44.0	47.1	50.3	53.4	56.6	59.7	62.9	66.0	69.2
2000	3.3	6.6	13.2	16.5	19.9	23.2	26.5	29.8	33.1	36.5	39.8	43.1	46.4	49.7	53.1	56.4	59.7	63.0	66.3	69.7	73.0
	CREW SYSTEM		PASSENGER SYSTEM																		

Check maximum pressure in shaded area.
Maximum cylinder pressure = 1850 PSI at 21°C.

Temperature corrections

Table 4

CYLINDER PRESSURE AT 21°C	PRESSURE CORRECTION FOR EACH 5°C PSI
400	7
600	11
800	14
1000	17
1200	21
1400	24
1600	28
1800	31
2000	34

If ambient temperature above 21°C, add increment shown.
If ambient temperature below 21°C, subtract increment shown.

Crew Oxygen Requirements

Table 1

NUMBER OF CREW	OXYGEN REQUIRED (LITERS)
2	660
3	990
4	1320

Table 2

NUMBER OF CREW	OXYGEN REQUIRED FOR LEVEL OFF AT 14000 FT (LITERS)			
	TOTAL POST DECOMPRESSION TIME (HR)			
	2	3	4	5
2	660	960	1270	1570
3	980	1440	1900	2360
4	1310	1920	2530	3140

Table 3

NUMBER OF CREW	ADDITIONAL LITERS REQUIRED FOR EACH MINUTE HELD AT INTERMEDIATE ALTITUDE OTHER THAN 14000 FT				
	INTERMEDIATE PRESSURE ALTITUDE (FT)				
	UP TO 13999	14000	14001 TO 17999	18000 TO 21999	22000 TO 25000
	REGULATOR ON "NORMAL" OR (100%)				
2	0 (22)	0 (17)	1 (16)	3 (12)	6 (10)
3	0 (33)	0 (25)	2 (24)	5 (18)	8 (15)
4	0 (44)	0 (34)	2 (32)	6 (24)	11 (20)

For more extensive than normal crew usage, add 2.05 liters/person/minute for each crew member at 8000 ft cabin altitude when regulator setting is NORMAL; or 13 liters/person/minute when regulator setting is 100%.

Instructions:

1. **Determine protective breathing requirements from Table 1.**
2. **Determine supplemental requirements for level off at 14000 ft from Table 2 and correct for level off altitudes other than 14000 ft using Table 3.**
3. **Flight crew system oxygen requirements are the larger of protective breathing (Table 1) or supplemental requirements (Table 2).**

Crew Oxygen Requirements

Table 4 - Cylinder Volume to Pressure Conversion

OXYGEN VOLUME (1000 LITERS)	CYLINDER PRESSURE AT 21°C (PSI)
.3	200
.7	300
1.0	400
1.4	500
1.7	600
2.1	700
2.4	800
2.8	900
3.1	1000
3.5	1100
3.8	1200
4.2	1300
4.5	1400
4.9	1500
5.2	1600
5.5	1700
5.9	1800
6.2	1900
6.6	2000

Check maximum pressure in shaded area. Maximum cylinder pressure = 1850 PSI at 21°C.For maximum cylinder pressure at hotter or colder temperatures, add or subtract 32 PSI per 5°C, respectively.

Table 5 - Temperature Corrections

CYLINDER PRESSURE AT 21°C (PSI)	PRESSURE CORRECTION FOR EACH 5°C ABOVE/BELOW 21°C (PSI)
400	+7/-7
600	+11/-11
800	+14/-14
1000	+17/-17
1200	+21/-21
1400	+24/-24
1600	+28/-28
1800	+31/-31
2000	+34/-34

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
29	151.8		
28	159.5	151.6	
27	167.5	159.5	151.3
26	175.8	167.6	159.2
25	184.4	176.1	167.4
24	192.4	183.7	174.7
23	200.6	191.7	182.1
22	209.1	199.9	189.8
21	218.0	208.4	197.8
20	227.1	217.2	206.1
19	236.0	225.9	214.5
18	245.2	234.8	223.2
17	254.6	244.0	232.1
16	264.3	253.5	241.4
15	272.4	261.5	248.8
14	280.8	269.5	256.4
13	289.2	277.7	264.2
12	297.8	285.8	272.1
11	305.6	292.9	278.6
10	313.5	300.0	284.7
9		306.8	290.2
8		313.4	295.8
7			301.3
6			306.6
5			311.8
4			316.2

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	10	12	14	16	18	20	22	24	26
ENGINE ONLY	-4.3	-3.8	-3.3	-2.7	-1.9	-1.1	-1.4	-1.2	-0.9
ENGINE AND WING	-5.7	-5.2	-4.7	-4.2	-3.4	-2.6	-3.2	-3.0	-2.8

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEAD WIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAIL WIND COMPONENT (KTS) 20	40	60	80	100
282	260	242	226	212	200	189	179	170	162	155
566	523	485	453	425	400	378	358	340	324	309
850	785	729	680	638	600	567	537	510	486	464
1134	1047	972	907	850	800	755	716	680	647	618
1418	1309	1215	1134	1063	1000	944	894	850	809	772
1703	1571	1458	1361	1275	1200	1133	1073	1019	971	927
1987	1833	1702	1588	1488	1400	1322	1252	1189	1132	1081
2271	2095	1945	1814	1700	1600	1511	1431	1359	1294	1235
2555	2357	2188	2041	1913	1800	1700	1610	1529	1456	1389
2839	2619	2431	2268	2126	2000	1888	1789	1699	1617	1544
3124	2882	2674	2495	2338	2200	2077	1967	1869	1779	1698
3408	3144	2918	2722	2551	2400	2266	2146	2038	1941	1852
3692	3406	3161	2949	2763	2600	2455	2325	2208	2103	2007
3976	3668	3404	3176	2976	2800	2644	2504	2378	2264	2161
4260	3930	3647	3403	3189	3000	2832	2683	2548	2426	2315

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG) 160	180	200	220	240	260	280	300
200	4.4	4.6	4.8	5.1	5.3	5.4	5.6	5.9
400	8.1	8.5	8.8	9.2	9.5	9.8	10.1	10.5
600	11.7	12.3	12.8	13.4	13.8	14.1	14.6	15.2
800	15.2	16.0	16.6	17.4	18.0	18.5	19.1	19.8
1000	18.8	19.7	20.5	21.4	22.2	22.8	23.5	24.4
1200	22.4	23.4	24.3	25.4	26.3	27.0	27.8	28.8
1400	25.9	27.1	28.2	29.4	30.5	31.3	32.2	33.3
1600	29.5	30.7	32.0	33.3	34.6	35.6	36.6	37.8
1800	33.0	34.3	35.7	37.2	38.6	39.7	40.8	42.2
2000	36.6	37.8	39.4	41.0	42.6	43.9	45.1	46.6
2200	40.1	41.4	43.1	44.9	46.6	48.0	49.4	51.0
2400	43.7	44.9	46.9	48.7	50.6	52.2	53.7	55.3
2600	47.2	48.5	50.5	52.5	54.5	56.2	57.9	59.6
2800	50.8	52.1	54.0	56.2	58.3	60.2	62.0	63.9
3000	54.3	55.6	57.6	59.9	62.2	64.2	66.2	68.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (4%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engine cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	227	212	200	189	179	170	162	155
572	527	488	455	426	400	377	357	339	322	307
861	792	734	683	639	600	566	535	508	483	460
1150	1058	979	911	852	800	754	713	676	643	613
1439	1323	1224	1139	1065	1000	942	891	845	804	766
1729	1589	1470	1367	1278	1200	1131	1069	1014	964	919
2018	1854	1715	1595	1491	1400	1319	1247	1183	1125	1072
2307	2119	1960	1823	1704	1600	1508	1425	1352	1285	1225
2596	2385	2206	2052	1918	1800	1696	1603	1520	1446	1378
2885	2650	2451	2280	2131	2000	1884	1781	1689	1606	1531
3174	2916	2696	2508	2344	2200	2073	1960	1858	1766	1683
3463	3181	2942	2736	2557	2400	2261	2138	2027	1927	1836
3752	3447	3187	2964	2770	2600	2450	2316	2196	2087	1989
4041	3712	3432	3192	2983	2800	2638	2494	2364	2248	2142
4330	3977	3678	3420	3196	3000	2826	2672	2533	2408	2295

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.0	4.3	4.5	4.8	5.0	5.3	5.6	5.8
400	7.4	7.9	8.3	8.7	9.2	9.6	10.1	10.5
600	10.6	11.3	12.0	12.7	13.3	14.0	14.6	15.3
800	13.8	14.7	15.6	16.5	17.4	18.3	19.2	20.0
1000	16.9	18.1	19.2	20.3	21.4	22.5	23.5	24.6
1200	20.1	21.5	22.8	24.1	25.3	26.6	27.9	29.1
1400	23.3	24.8	26.4	27.8	29.3	30.8	32.3	33.7
1600	26.5	28.2	29.9	31.6	33.3	35.0	36.6	38.2
1800	29.6	31.3	33.3	35.2	37.1	39.0	40.8	42.6
2000	32.8	34.5	36.7	38.8	40.8	42.9	45.0	47.0
2200	36.0	37.7	40.1	42.4	44.6	46.9	49.1	51.3
2400	39.2	40.9	43.4	45.9	48.4	50.9	53.3	55.7
2600	42.3	44.0	46.8	49.5	52.1	54.8	57.4	59.9
2800	45.5	47.2	50.0	52.9	55.7	58.5	61.3	64.1
3000	48.7	50.4	53.2	56.3	59.3	62.3	65.3	68.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
264	248	234	221	210	200	190	182	174	167	160
530	498	469	443	420	400	381	364	348	334	320
799	749	705	666	631	600	571	545	521	500	480
1069	1002	942	889	842	800	761	726	694	665	638
1342	1256	1180	1113	1053	1000	951	907	867	830	796
1615	1511	1419	1337	1265	1200	1141	1087	1039	995	954
1890	1767	1658	1562	1476	1400	1330	1268	1211	1159	1111
2167	2023	1898	1787	1688	1600	1520	1448	1382	1323	1268
2444	2280	2138	2012	1900	1800	1709	1628	1554	1486	1424
2721	2538	2378	2237	2112	2000	1899	1808	1725	1649	1580
2999	2796	2618	2462	2323	2200	2088	1988	1896	1813	1736
3277	3054	2859	2687	2535	2400	2277	2167	2067	1976	1893
3555	3312	3099	2913	2747	2600	2467	2347	2238	2139	2049
3833	3569	3340	3138	2959	2800	2656	2527	2410	2303	2205
4110	3827	3580	3363	3171	3000	2846	2707	2581	2466	2361

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.2	4.4	4.6	4.9	5.1	5.3	5.6	5.7
400	6.8	7.3	7.8	8.3	8.8	9.4	9.9	10.3
600	9.2	10.0	10.8	11.6	12.4	13.3	14.1	14.8
800	11.6	12.7	13.8	14.9	16.0	17.1	18.3	19.2
1000	14.0	15.3	16.7	18.1	19.5	20.9	22.4	23.6
1200	16.3	18.0	19.6	21.3	23.0	24.7	26.4	28.0
1400	18.6	20.5	22.5	24.4	26.4	28.4	30.5	32.2
1600	20.9	23.1	25.3	27.6	29.8	32.1	34.4	36.5
1800	23.2	25.6	28.1	30.7	33.2	35.7	38.4	40.7
2000	25.4	28.2	30.9	33.7	36.5	39.3	42.2	44.8
2200	27.6	30.6	33.7	36.7	39.8	42.9	46.1	48.9
2400	29.8	33.1	36.4	39.7	43.0	46.4	49.9	52.9
2600	32.0	35.5	39.1	42.7	46.3	49.9	53.6	57.0
2800	34.1	37.9	41.7	45.6	49.4	53.3	57.3	60.9
3000	36.2	40.3	44.4	48.5	52.6	56.7	61.0	64.8

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - 320 KIAS Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
292	267	246	229	213	200	188	178	168	160	152
566	523	485	453	425	400	378	358	340	324	309
840	778	724	678	636	600	568	538	512	488	467
1115	1034	963	902	848	800	757	719	684	653	624
1390	1289	1202	1126	1059	1000	947	899	856	817	781
1664	1545	1441	1351	1271	1200	1137	1080	1028	981	938
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1096
2213	2056	1919	1799	1694	1600	1516	1440	1372	1310	1253
2488	2311	2158	2024	1905	1800	1706	1621	1544	1474	1410
2763	2567	2397	2248	2117	2000	1895	1801	1716	1638	1567
3037	2822	2636	2473	2328	2200	2085	1981	1888	1802	1725
3312	3078	2875	2697	2540	2400	2275	2162	2060	1967	1882
3587	3334	3114	2921	2751	2600	2464	2342	2232	2131	2039
3861	3589	3353	3146	2963	2800	2654	2523	2404	2295	2196
4136	3845	3592	3370	3174	3000	2844	2703	2576	2460	2354

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.3	4.5	4.6	4.8	5.1	5.3	5.5	5.8
400	8.1	8.3	8.6	8.9	9.3	9.7	10.1	10.5
600	11.8	12.2	12.6	13.0	13.5	14.0	14.6	15.3
800	15.5	15.9	16.4	17.0	17.7	18.4	19.2	20.0
1000	19.2	19.7	20.3	21.0	21.7	22.6	23.5	24.6
1200	22.9	23.5	24.2	25.0	25.8	26.8	27.9	29.1
1400	26.6	27.3	28.1	28.9	29.9	31.0	32.3	33.6
1600	30.3	31.0	31.9	32.9	34.0	35.3	36.7	38.2
1800	34.1	34.7	35.7	36.7	38.0	39.4	40.9	42.6
2000	37.8	38.4	39.4	40.6	41.9	43.5	45.1	47.0
2200	41.5	42.1	43.2	44.5	45.9	47.5	49.3	51.3
2400	45.2	45.8	47.0	48.4	49.9	51.6	53.6	55.7
2600	48.9	49.6	50.7	52.2	53.8	55.7	57.7	60.0
2800	52.6	53.3	54.4	56.0	57.7	59.6	61.8	64.2
3000	56.3	57.0	58.1	59.7	61.6	63.6	65.9	68.4

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - .84M/320 KIAS Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
259	244	231	220	209	200	191	183	175	169	162
519	490	464	440	419	400	382	366	351	337	325
781	736	697	661	629	600	573	549	526	505	486
1044	984	930	882	839	800	764	731	701	673	648
1307	1232	1164	1103	1049	1000	955	913	876	841	809
1572	1480	1398	1325	1259	1200	1145	1096	1050	1008	970
1836	1728	1633	1547	1469	1400	1336	1278	1225	1176	1130
2101	1977	1867	1768	1680	1600	1527	1460	1399	1343	1291
2366	2226	2101	1990	1890	1800	1717	1642	1573	1510	1452
2631	2475	2336	2212	2100	2000	1908	1824	1748	1677	1613
2895	2723	2570	2433	2311	2200	2099	2007	1922	1845	1773
3159	2971	2804	2655	2521	2400	2289	2189	2097	2013	1935
3421	3218	3037	2876	2731	2600	2480	2372	2272	2180	2096
3683	3464	3270	3097	2941	2800	2671	2554	2447	2349	2258
3943	3710	3502	3317	3150	3000	2862	2737	2623	2517	2420

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.4	4.5	4.7	4.9	5.0	5.2	5.4	5.5
400	7.6	7.9	8.2	8.6	8.9	9.3	9.7	10.1
600	10.9	11.2	11.7	12.2	12.7	13.4	14.0	14.6
800	14.0	14.5	15.1	15.7	16.4	17.3	18.2	19.0
1000	17.2	17.8	18.5	19.3	20.1	21.1	22.2	23.4
1200	20.4	21.0	21.9	22.8	23.8	25.0	26.3	27.6
1400	23.5	24.3	25.2	26.2	27.4	28.8	30.3	31.9
1600	26.6	27.5	28.5	29.7	31.0	32.6	34.3	36.1
1800	29.8	30.7	31.8	33.1	34.6	36.3	38.3	40.3
2000	32.9	33.9	35.1	36.5	38.2	40.0	42.2	44.4
2200	36.0	37.1	38.4	39.9	41.7	43.7	46.1	48.5
2400	39.1	40.3	41.7	43.3	45.2	47.4	49.9	52.6
2600	42.2	43.4	44.9	46.7	48.7	51.1	53.7	56.6
2800	45.3	46.6	48.2	50.0	52.2	54.7	57.5	60.6
3000	48.3	49.7	51.4	53.4	55.6	58.3	61.3	64.5

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (11%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Intentionally
Blank

Performance Dispatch — Chapter PD
Landing — Section 22

Landing Field Limit Weight - Dry Runway
Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200				1200	1250	1350	1410	1500
1400		1130	1250	1400	1460	1560	1630	1730
1600	1200	1310	1440	1600	1670	1770	1860	1960
1800	1370	1490	1630	1800	1880	1980	2080	2190
2000	1540	1670	1830	2000	2090	2190	2300	2420
2200	1710	1860	2020	2200	2310	2400	2530	2650
2400	1880	2040	2210	2400	2520	2610	2750	2880
2600	2050	2220	2400	2600	2730	2820	2970	3110
2800	2220	2380	2580	2800	2940	3030	3190	3340
3000	2350	2530	2750	3000	3150	3240	3420	3570
3200	2480	2690	2930	3200	3360	3450	3640	3800
3400	2620	2840	3100	3400	3570	3660	3860	
3600	2750	3000	3280	3600	3780	3870		
3800	2880	3160	3450	3800				
4000	3010	3310	3620	4000				
4200	3140	3470	3800					
4400	3280	3620	3980					
4600	3410	3780	4150					
4800	3540	3940						
5000	3670	4090						

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1200	144.2	135.7			
1400	177.2	166.9	156.9	147.3	138.2
1600	210.9	198.6	186.7	175.4	164.8
1800	234.8	226.6	217.2	204.1	191.8
2000	253.9	245.1	236.4	227.9	219.2
2200	272.1	262.8	253.5	244.5	235.7
2400	289.3	279.5	269.9	260.4	251.0
2600	305.4	295.4	285.4	275.5	265.8
2800	321.0	310.4	300.1	289.9	279.8
3000		322.9	311.6	301.3	291.2
3200			322.1	311.3	300.9
3400				320.8	309.9
3600					318.6
3800					327.4

With 1 brake deactivated, decrease weight by 16200 kg.
With 2 brakes deactivated, decrease weight by 32900 kg.
With manual speedbrakes, decrease weight by 17500 kg.

Landing Field Limit Weight - Wet Runway
Flaps 30
Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200						1360	1420	1520
1400				1400	1460	1570	1640	1750
1600		1290	1430	1600	1670	1780	1870	1980
1800	1350	1470	1620	1800	1880	1990	2090	2210
2000	1520	1650	1810	2000	2090	2200	2310	2440
2200	1690	1830	2000	2200	2300	2410	2540	2670
2400	1860	2020	2190	2400	2510	2620	2760	2900
2600	2030	2200	2390	2600	2720	2830	2980	3130
2800	2200	2380	2580	2800	2940	3040	3200	3360
3000	2370	2560	2770	3000	3150	3250	3430	3590
3200	2540	2720	2940	3200	3360	3460	3650	3820
3400	2670	2870	3120	3400	3570	3670	3870	4050
3600	2800	3030	3290	3600	3780	3880	4100	4280
3800	2940	3180	3470	3800	3990	4090	4320	
4000	3070	3340	3640	4000	4200			
4200	3200	3500	3820	4200				
4400	3330	3650	3990	4400				
4600	3460	3810	4170	4600				
4800	3600	3960	4340					
5000	3730	4120	4520					

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	147.1	138.4			
1600	175.8	165.5	155.6	146.1	137.0
1800	205.0	193.0	181.5	170.5	160.1
2000	228.7	219.3	207.9	195.4	183.5
2200	245.7	237.2	228.7	219.9	207.2
2400	262.0	252.9	244.0	235.2	226.7
2600	277.4	267.9	258.6	249.4	240.4
2800	292.1	282.3	272.6	263.0	253.6
3000	306.0	296.0	286.1	276.1	266.4
3200	319.6	309.1	298.8	288.7	278.6
3400		320.2	309.3	299.1	289.0
3600			318.5	307.8	297.6
3800				316.2	305.6
4000				324.5	313.3
4200					320.9

With 1 brake deactivated, decrease weight by 16200 kg.
With 2 brakes deactivated, decrease weight by 32900 kg.
With manual speedbrakes, decrease weight by 17500 kg.

Landing Climb Limit Weight
Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	258.6	243.7				
52	126	264.6	249.6				
50	122	270.9	255.3	236.3			
48	118	277.2	261.0	242.0			
46	115	283.6	266.6	247.5	227.9		
44	111	289.9	272.9	253.0	232.3		
42	108	294.5	279.4	258.3	236.5	219.7	
40	104	298.9	285.7	263.4	240.9	223.4	
38	100	303.1	290.9	268.8	244.9	226.8	209.6
36	97	307.2	296.1	273.9	249.0	230.3	212.9
34	93	311.2	300.9	278.2	253.1	233.7	216.1
32	90	311.3	305.3	282.4	256.9	237.2	219.3
30	86	311.3	309.7	286.6	260.6	240.8	222.4
28	82	311.4	309.7	290.4	264.4	244.5	225.8
26	79	311.4	309.7	294.1	267.9	248.0	229.2
24	75	311.5	309.8	294.9	271.1	251.4	232.5
22	72	311.6	309.8	294.9	274.2	253.5	234.1
20	68	311.6	309.9	294.9	274.8	254.5	235.5
18	64	311.6	309.9	295.0	274.9	255.6	237.2
16	61	311.6	310.0	295.1	274.9	256.1	239.0
14	57	311.7	310.0	295.1	275.0	256.1	240.5
12	54	311.7	310.1	295.2	275.0	256.2	240.6
10	50	311.8	310.2	295.2	275.1	256.2	240.7
-40	-40	312.9	311.5	296.6	276.3	257.3	241.7

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 900 kg.
With engine and wing anti-ice on, decrease weight by 1450 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature is below 10°C, decrease weight by 20800 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 20, Gear Up

Based on engine bleed for packs on or off, engine anti-ice on or off and wing anti-ice off.

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	6.55	5.65					
50	7.31	6.40	5.22				
46	8.10	7.13	5.96	4.72			
42	8.73	7.92	6.64	5.24	4.18		
38	9.28	8.57	7.23	5.73	4.61	3.55	
34	9.78	9.11	7.74	6.22	5.03	3.95	
30	9.79	9.64	8.20	6.67	5.46	4.32	3.27
26	9.80	9.66	8.58	7.06	5.83	4.69	3.60
22	9.81	9.67	8.62	7.38	6.14	4.95	3.87
18	9.81	9.68	8.63	7.44	6.27	5.13	3.99
14	9.82	9.68	8.64	7.45	6.32	5.35	4.15
10	9.83	9.69	8.64	7.45	6.32	5.36	4.38

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
280	-2.98	-3.42	-3.87	-4.31	-4.75	-5.13	-5.50	-5.88	-6.27	-6.65
260	-3.06	-3.33	-3.61	-3.88	-4.15	-4.46	-4.79	-5.12	-5.46	-5.80
240	-2.50	-2.72	-2.94	-3.16	-3.38	-3.65	-3.92	-4.19	-4.46	-4.74
220	-1.88	-2.03	-2.18	-2.33	-2.48	-2.67	-2.88	-3.07	-3.28	-3.48
200	-1.13	-1.19	-1.25	-1.31	-1.37	-1.49	-1.61	-1.72	-1.83	-1.94
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	1.16	1.30	1.44	1.57	1.71	1.85	1.99	2.13	2.29	2.45
140	2.57	2.92	3.26	3.60	3.95	4.27	4.59	4.94	5.31	5.70

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
VREF	-0.27	-0.28	-0.29	-0.30	-0.31	-0.32	-0.32	-0.33	-0.33	-0.32
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.16	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.15
VREF+15	0.27	0.26	0.26	0.26	0.27	0.28	0.28	0.26	0.24	0.22
VREF+20	0.33	0.32	0.32	0.33	0.34	0.35	0.34	0.32	0.28	0.23
VREF+25	0.35	0.34	0.33	0.34	0.35	0.36	0.35	0.31	0.26	0.20
VREF+30	0.32	0.30	0.29	0.28	0.29	0.28	0.26	0.22	0.17	0.11

With engine and wing anti-ice on, decrease gradient by 0.1%.
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 0.6%.

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235				
50	122	236	227			
45	113	238	229	220		
40	104	241	231	222	214	
35	95	243	233	224	216	208
30	86	245	235	226	217	209
25	77	247	238	228	219	211
20	68	249	240	230	221	213
15	59	252	242	232	223	215
10	50	254	244	235	225	217
5	41	257	247	237	228	219
0	32	259	249	239	230	221
-5	23	262	252	242	232	223
-10	14	265	254	244	234	225
-15	5	268	257	247	237	227
-20	-4	271	260	249	239	230
-30	-22	277	266	255	245	235
-40	-40	284	272	261	250	240
-50	-58	291	279	268	256	246
-54	-65	294	282	270	259	248

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 6100 kg per 1% downhill slope. Increase weight by 5800 kg per 10 knots headwind. Decrease weight by 36600 kg per 10 knots tailwind.

Decrease weight by 13000 kg when one brake is deactivated. Decrease weight by 26800 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

Intentionally
Blank

GEAR DOWN

Takeoff Climb Limit Weight
Flaps 15

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	178.8	171.4	164.4	155.0	145.9
52	126	183.8	171.4	164.3	154.9	145.9
50	122	188.6	172.3	164.3	154.9	145.8
48	118	193.3	176.8	164.2	154.8	145.8
46	115	198.1	181.1	165.1	154.8	145.7
44	111	202.7	185.5	169.3	154.7	145.7
42	108	207.3	189.7	173.2	155.6	145.7
40	104	211.9	194.0	177.1	159.5	145.6
38	100	216.8	198.1	181.0	163.3	146.5
36	97	221.7	202.3	184.9	167.1	150.1
34	93	226.5	207.4	188.8	170.8	153.7
32	90	231.3	212.5	192.7	174.5	157.3
30	86	236.1	217.4	197.8	178.2	160.9
28	82	240.7	222.2	202.8	182.0	164.5
26	79	245.3	226.9	207.7	186.9	168.1
24	75	247.6	231.4	212.5	191.7	171.7
22	72	247.6	235.9	217.0	196.4	176.4
20	68	247.6	238.1	221.5	200.9	181.0
18	64	247.6	238.1	225.8	205.3	185.4
16	61	247.6	238.1	227.8	209.6	189.7
14	57	247.6	238.0	227.7	212.9	193.9
12	54	247.6	238.0	227.7	212.9	198.0
10	50	247.6	238.0	227.7	212.9	199.9
-40	-40	246.8	237.3	226.5	213.7	200.6

With engine bleeds for packs off, increase weight by 100 kg.
With engine anti-ice on, decrease weight by 4000 kg.
With engine and wing anti-ice on, decrease weight by 4900 kg.

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	211.0			
52	126	216.2	208.1		
50	122	221.2	213.2	205.3	
48	118	226.2	218.3	210.1	201.8
46	115	231.0	223.1	214.9	205.9
44	111	236.0	227.8	219.5	210.1
42	108	241.2	232.4	224.0	214.0
40	104	246.4	236.9	228.2	217.9
38	100	250.3	241.2	232.2	221.7
36	97	254.1	244.8	236.0	225.4
34	93	257.9	248.5	239.3	228.8
32	90	261.5	251.9	242.6	232.0
30	86	265.2	255.2	245.8	235.1
28	82	265.1	258.4	248.6	238.0
26	79	265.2	258.6	251.5	240.7
24	75	265.2	258.6	252.0	243.3
22	72	265.2	258.7	252.1	243.8
20	68	265.3	258.7	252.1	243.9
18	64	265.3	258.8	252.2	243.9
16	61	265.4	258.8	252.2	244.0
14	57	265.4	258.8	252.3	244.0
12	54	265.5	258.9	252.3	244.0
10	50	265.5	258.9	252.3	244.1
0	32	265.8	259.1	252.5	244.3

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight by 700 kg.
With engine and wing anti-ice on, decrease weight by 1100 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26300 kg.

GEAR DOWN

Takeoff Obstacle Limit Weight

Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off

Flaps 15

Sea Level, 29°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	240.0										
20	228.8	240.0	240.0								
40	211.3	225.9	237.1	240.0							
60	197.8	212.7	224.2	233.3	240.0	240.0					
80	186.9	201.7	213.5	223.0	230.7	237.1	240.0	240.0			
100	177.7	192.3	204.3	214.1	222.1	228.8	234.5	239.1	240.0		
120	169.7	184.2	196.1	206.1	214.4	221.3	227.3	232.4	236.8	240.0	240.0
140	162.7	177.0	188.9	198.9	207.4	214.6	220.7	226.1	230.7	234.8	238.4
160	156.4	170.5	182.3	192.4	200.9	208.3	214.7	220.2	225.0	229.3	233.1
180	150.7	164.6	176.3	186.4	195.1	202.5	209.0	214.8	219.7	224.2	228.1
200		159.2	170.9	180.9	189.6	197.2	203.8	209.6	214.8	219.3	223.4
220		154.2	165.8	175.8	184.5	192.2	198.9	204.8	210.0	214.7	218.9
240		149.6	161.2	171.1	179.8	187.5	194.2	200.2	205.6	210.4	214.7
260			156.8	166.7	175.4	183.0	189.9	195.9	201.3	206.2	210.6
280			152.7	162.5	171.2	178.9	185.7	191.8	197.3	202.3	206.7
300			148.8	158.6	167.3	174.9	181.8	188.0	193.5	198.5	203.0

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
29 & BELOW	0	0	0	0	0	0	0
30	-1.1	-1.3	-1.6	-1.8	-2.1	-2.3	-2.6
32	-2.7	-3.6	-4.5	-5.3	-6.2	-7.1	-8.0
34	-4.3	-5.8	-7.3	-8.8	-10.3	-11.9	-13.4
36	-5.9	-8.1	-10.2	-12.3	-14.5	-16.6	-18.8
38	-7.5	-10.3	-13.1	-15.8	-18.6	-21.4	-24.1
40	-9.2	-12.5	-15.9	-19.3	-22.7	-26.1	-29.5
42	-10.5	-14.5	-18.6	-22.7	-26.8	-30.9	-35.0
44	-11.8	-16.5	-21.3	-26.1	-30.9	-35.7	-40.5
46	-13.1	-18.5	-24.0	-29.5	-35.0	-40.5	-46.0
48	-14.4	-20.5	-26.7	-32.9	-39.1	-45.3	-51.4
50	-15.7	-22.5	-29.4	-36.3	-43.2	-50.0	-56.9

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
S.L. & BELOW	0	0	0	0	0	0	0
1000	-5.4	-6.1	-6.9	-7.7	-8.4	-9.2	-10.0
2000	-10.8	-12.3	-13.8	-15.3	-16.9	-18.4	-19.9
3000	-15.7	-18.2	-20.6	-23.0	-25.4	-27.8	-30.3
4000	-20.7	-24.0	-27.3	-30.6	-34.0	-37.3	-40.6
5000	-24.8	-29.3	-33.7	-38.1	-42.5	-46.9	-51.3
6000	-29.0	-34.5	-40.0	-45.5	-51.0	-56.5	-62.0
7000	-32.5	-39.3	-46.0	-52.8	-59.5	-66.2	-73.0
8000	-36.0	-44.0	-52.0	-60.0	-68.0	-76.0	-84.0

GEAR DOWN

Takeoff Obstacle Limit Weight

Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
15 TW	-20.8	-20.6	-20.5	-20.4	-20.2	-20.1	-20.0
10 TW	-13.8	-13.8	-13.7	-13.6	-13.5	-13.4	-13.3
5 TW	-6.9	-6.9	-6.8	-6.8	-6.8	-6.7	-6.7
0	0	0	0	0	0	0	0
10 HW	3.5	3.0	2.5	2.0	1.5	1.0	0.5
20 HW	7.0	6.0	5.0	4.0	3.0	2.0	1.0
30 HW	10.5	9.0	7.5	6.0	4.5	3.0	1.5
40 HW	14.0	12.0	10.0	8.0	6.0	4.0	2.0

With engine bleed for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 1000 kg.
With engine and wing anti-ice on, decrease weight by 1700 kg.

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13000	10400	7300
290	14600	12000	9100
280	16200	13700	11000
270	17800	15500	12800
260	19500	17200	14600
250	21100	18900	16400
240	22500	20500	18200
230	24000	22000	20100
220	25300	23600	21700
210	26300	25100	23300
200	27300	26100	25000
190	28300	27100	26000
180	29400	28200	27100
170	30600	29300	28200
160	32100	30500	29300
150	33800	32100	30600
140	35700	34000	32300

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
329	292	261	236	216	200	187	175	165	156	148
497	441	393	356	326	300	281	263	247	234	222
663	589	526	476	435	400	374	351	330	312	296
828	736	657	595	544	500	468	438	412	389	370
992	882	788	714	653	600	561	526	495	468	444
1155	1028	918	832	762	700	655	614	578	546	519
1317	1172	1048	950	870	800	748	702	661	625	593
1478	1317	1178	1068	978	899	841	790	743	702	667
1638	1461	1308	1186	1086	999	935	877	826	781	742
1797	1603	1437	1304	1194	1100	1029	966	910	860	818
1955	1746	1565	1421	1303	1200	1124	1055	993	939	893
2112	1887	1693	1538	1410	1300	1218	1143	1077	1018	968
2269	2028	1821	1655	1519	1400	1312	1232	1160	1097	1043
2426	2170	1950	1773	1627	1500	1406	1320	1244	1177	1119
2582	2311	2078	1890	1736	1600	1500	1409	1328	1256	1194
2736	2451	2205	2007	1843	1700	1594	1497	1411	1335	1269
2890	2591	2332	2124	1951	1800	1688	1586	1495	1415	1345
3043	2730	2459	2240	2059	1900	1782	1675	1579	1494	1421
3196	2868	2585	2356	2166	2000	1876	1764	1663	1574	1497
3348	3007	2711	2472	2274	2100	1970	1853	1747	1654	1573
3499	3144	2837	2588	2382	2200	2065	1942	1831	1734	1649
3650	3281	2962	2704	2489	2300	2159	2031	1916	1814	1725
3800	3418	3087	2819	2596	2400	2253	2120	2000	1894	1801
3949	3555	3213	2935	2704	2500	2347	2208	2083	1973	1877
4098	3691	3338	3050	2811	2600	2440	2296	2167	2053	1953
4247	3827	3462	3166	2918	2700	2534	2385	2251	2133	2029

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.5	0:52	7.2	0:50	6.9	0:48	6.7	0:47	6.6	0:46
300	11.1	1:16	10.6	1:13	10.1	1:10	9.7	1:07	9.5	1:05
400	14.8	1:40	14.0	1:35	13.3	1:31	12.7	1:27	12.3	1:24
500	18.5	2:03	17.5	1:58	16.6	1:52	15.8	1:47	15.2	1:43
600	22.2	2:27	20.9	2:20	19.8	2:13	18.8	2:07	18.1	2:02
700	26.0	2:50	24.5	2:42	23.1	2:33	22.0	2:26	21.1	2:20
800	29.8	3:13	28.0	3:03	26.4	2:54	25.1	2:46	24.0	2:38
900	33.7	3:36	31.7	3:25	29.8	3:14	28.2	3:05		
1000	37.5	3:59	35.3	3:46	33.2	3:34	31.4	3:24		
1100	41.5	4:21	39.0	4:07	36.7	3:55	34.7	3:44		
1200	45.4	4:43	42.7	4:28	40.2	4:15	38.0	4:03		
1300	49.5	5:05	46.5	4:49	43.7	4:35	41.3	4:22		
1400	53.5	5:27	50.3	5:10	47.2	4:54	44.6	4:40		
1500	57.7	5:49	54.1	5:31	50.8	5:14	48.0	4:59		
1600	61.8	6:10	58.0	5:51	54.5	5:33	51.4	5:18		
1700	66.1	6:31	61.9	6:11	58.1	5:53				
1800	70.3	6:53	65.9	6:31	61.8	6:12				
1900	74.6	7:13	69.9	6:51	65.6	6:31				
2000	78.9	7:34	73.9	7:11	69.3	6:50				

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.7	1.4
15	-1.8	-0.9	0.0	1.0	2.1
20	-2.4	-1.2	0.0	1.4	2.8
25	-3.0	-1.5	0.0	1.7	3.4
30	-3.6	-1.8	0.0	2.0	4.1
35	-4.2	-2.1	0.0	2.4	4.9
40	-4.8	-2.4	0.0	2.7	5.6
45	-5.4	-2.7	0.0	3.0	6.3
50	-6.0	-3.0	0.0	3.4	7.1
55	-6.6	-3.3	0.0	3.7	7.9
60	-7.2	-3.6	0.0	4.1	8.6
65	-7.8	-3.9	0.0	4.4	9.4
70	-8.4	-4.2	0.0	4.8	10.3
75	-9.1	-4.6	0.0	5.2	11.1

Based on VREF30+80 climb, LRC, and VREF30+80 descent.

GEAR DOWN

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
103	85	72	63	56	50	45	41	38	35	33
176	152	135	121	109	100	92	85	79	74	70
249	220	197	178	163	150	139	129	121	114	107
321	286	258	235	216	200	186	174	163	154	145
392	352	320	292	270	250	233	218	205	194	183
463	418	380	349	323	300	280	263	248	234	222
534	483	441	406	376	350	327	308	290	274	260
606	549	502	463	429	400	375	352	332	315	299
678	615	564	520	482	450	422	397	375	355	337
751	682	625	577	536	500	469	441	417	395	375

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.8	2.0	2.2	2.3	2.5	0:15
	ALT (FT)	14000	12000	10000	10000	8000	
100	FUEL (1000 KG)	3.2	3.5	3.8	4.1	4.4	0:26
	ALT (FT)	24000	22000	20000	18000	16000	
150	FUEL (1000 KG)	4.4	4.8	5.2	5.7	6.2	0:36
	ALT (FT)	30000	26000	24000	22000	20000	
200	FUEL (1000 KG)	5.5	6.1	6.6	7.3	7.9	0:46
	ALT (FT)	30000	28000	26000	24000	20000	
250	FUEL (1000 KG)	6.6	7.3	8.1	8.8	9.6	0:56
	ALT (FT)	30000	28000	26000	24000	20000	
300	FUEL (1000 KG)	7.8	8.6	9.5	10.4	11.4	1:05
	ALT (FT)	30000	28000	26000	24000	20000	
350	FUEL (1000 KG)	8.9	9.9	10.9	12.1	13.2	1:15
	ALT (FT)	30000	28000	26000	22000	20000	
400	FUEL (1000 KG)	10.1	11.2	12.3	13.7	14.9	1:24
	ALT (FT)	30000	28000	26000	22000	20000	
450	FUEL (1000 KG)	11.3	12.5	13.8	15.3	16.7	1:34
	ALT (FT)	30000	28000	26000	22000	20000	
500	FUEL (1000 KG)	12.4	13.8	15.2	17.0	18.9	1:44
	ALT (FT)	30000	28000	26000	22000	18000	

GEAR DOWN

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)							
	PRESSURE ALTITUDE (FT)							
	1500	5000	10000	15000	20000	25000	30000	35000
300	14300	14300	14340	14520				
280	13310	13310	13320	13430				
260	12380	12360	12340	12400	12660			
240	11500	11460	11430	11430	11560			
220	10650	10590	10550	10520	10570	10850		
200	10080	9750	9690	9660	9660	9790		
180	9270	8950	8870	8840	8810	8850	9110	
160	8480	8370	8060	8020	7980	7980	8120	
140	7690	7590	7280	7340	7310	7150	7200	7440

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE(FT)				
	1500	5000	10000	15000	20000
300	13660	13660	13660	13770	
280	12730	12720	12700	12770	13050
260	11830	11800	11780	11810	11980
240	10970	10910	10890	10880	10970
220	10120	10040	10000	9980	10020
200	9520	9200	9130	9110	9110
180	8690	8600	8290	8260	8240
160	7860	7780	7470	7540	7520
140	7180	7110	6990	6730	6700

These tables include 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
18	150.6		
17	156.6	149.1	
16	162.8	155.1	146.7
15	168.4	160.5	151.9
14	174.1	166.1	157.3
13	179.9	171.8	162.9
12	185.9	177.6	168.6
11	191.7	183.1	173.8
10	197.6	188.7	179.1
9	203.0	193.7	183.9
8	208.3	198.9	188.8
7	213.7	204.1	193.7
6	219.1	209.3	198.7
5	224.6	214.5	203.8
4	229.1	218.8	207.9
3	233.4	222.9	212.0
2	237.5	227.1	216.1

Anti-ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)					
	PRESSURE ALTITUDE (1000 FT)					
	8	10	12	14	16	18
ENGINE ONLY	-3.3	-3.4	-3.4	-3.2	-2.4	-1.4
ENGINE AND WING	-4.1	-4.3	-4.4	-4.4	-3.6	-2.4

Intentionally
Blank

Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Brake Energy, and Obstacle Limit Weights as determined from the following tables. Tire Limit is not shown as it is not limiting for the range of conditions shown in this chapter.

Field Limit Weight - Slope and Wind Corrections

These tables provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction table with slope corrected field length and wind component to determine the slope and wind corrected field length.

Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude with “Slope and Wind Corrected Field Length” determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

Brake Energy Limits VMBE

Tables are presented to determine the Maximum Brake Energy Speed VMBE. Compliance with this limitation is required to ensure that the brakes have enough capacity to execute a maximum effort stop from V1 without the use of thrust reversers. Enter the upper table with pressure altitude and OAT to determine the reference VMBE. Then enter the lower table with the reference VMBE and brake release weight to determine VMBE for a specific takeoff. Adjust for slope, wind and deactivated brakes as described below the table. The resulting VMBE must be greater than or equal to V1. If VMBE is less than V1, brake release weight must be decreased by the amount shown below the table.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field and brake energy limit weights and the V1 and VMBE must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3500 kg and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 7300 kg and the V1 associated with the reduced weight by three knots. If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance corrected for wind and slope exceeds approximately 1540m for one brake deactivated or 1610 m for two brakes deactivated.

For brake(s) deactivated, reduce VMBE by the amount shown on the Brake Energy Limit VMBE Chart. If the resulting VMBE is less than V1, the brake release weight must be reduced according to the instructions on the brake energy limit chart. The resulting V1 must not be less than V1(MCG). Determine VR and V2 for the actual weight.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited

condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability at two center of gravity positions: 7.5% MAC (FMC default) for use when no center of gravity is entered on the PERF INIT page, and 30% MAC (typical mid cruise center of gravity) for use when 30% MAC is entered. Crews may interpolate between these values to determine the airplane's capability at other specific center of gravity positions. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time Table with air distance from the Ground to Air Miles Conversion Table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment Table with the Reference Fuel and the planned landing weight to obtain fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance

as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Oxygen Requirements

Passenger Oxygen System - Gaseous

Data is provided to determine minimum oxygen cylinder pressure dispatch requirements. Table 1 shows oxygen quantity required to complete the direct emergency descent to 10,000 ft. Table 2 shows oxygen quantity required per minute for the number of passenger cabin occupants at various level off intermediate altitude above 10,000 ft. The minimum oxygen quantity required for a particular flight is obtained from Table 1 by intersecting the number of passenger occupants and the initial cruise altitude to obtain the oxygen quantity in liters. If the flight is planned to level off the cruise at the intermediate altitude after descent from the initial altitude, the total oxygen quantity required is obtained by summation of Table 1, the oxygen requirement for the direct descent to 10,000 ft, plus values from Table 2 multiplied by the time duration at the level off intermediate altitude.

After determining the total volume (in liters) required from Tables 1 and 2, the liters to pressure conversion table is used to establish the minimum dispatch pressure for the particular cylinder configuration installed in the

airplane. Temperature corrections for non-reference conditions are given must be used to adjust the required dispatch pressure at 21°C (70°F) to final flight dispatch value.

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck.

Tables are provided to determine the flight crew oxygen dispatch requirements. Table 1 shows minimum oxygen quantity necessary to ensure that protective breathing requirements are satisfied. Table 2 shows the supplemental oxygen requirement for loss of pressurization, emergency descent and total post decompression flight time above 10000 ft. Table 3 gives adjustments that must be applied to Table 2 crew member supplemental requirements in situations where the enroute altitude after decompression will exceed 14000 ft. The increments shown in Table 3 reflect only the increase in oxygen flow rate associated with periods of post decompression flight at altitudes other than 14000 ft. Hence, this time must also be included in the Table 2 time value used.

Table 1, Table 2 and Table 3 values are based on “NORMAL” regulator settings. Table 3 also shows “100%” regulator setting adjustments that can be used if the operator chooses to schedule oxygen dispatch requirements based on pure oxygen availability.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (0.6 psi/person/minute for the dual cylinder system) or 13 liters/person/minute (4 psi/person/minute) if 100% oxygen is selected during normal usage.

After determining the total volume (liters) required for the flight crew by using the larger value from Table 1 or Table 2, obtain the dispatch pressure required from the Cylinder Volume to Pressure Conversion table (Table 4). Adjust this reading for cylinder temperature as required, using the adjustments given (Table 5).

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 30.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

Gear Down

This section provides flight planning data for revenue operation with gear down.

Takeoff/Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to determine Takeoff Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

Performance Dispatch — Chapter PD

Table of Contents — Section 30

777-300 TRENT892 KG FAA

Takeoff Field Corrections
Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1220	1220	1210	1210	1200	1180	1160	1140	1120
1400	1430	1420	1410	1410	1400	1380	1350	1330	1300
1600	1630	1630	1620	1610	1600	1570	1540	1510	1480
1800	1840	1830	1820	1810	1800	1770	1730	1700	1660
2000	2060	2050	2030	2020	2000	1960	1920	1880	1840
2200	2290	2270	2240	2220	2200	2160	2110	2070	2020
2400	2510	2480	2460	2430	2400	2350	2300	2250	2200
2600	2730	2700	2660	2630	2600	2540	2490	2430	2380
2800	2950	2910	2870	2840	2800	2740	2680	2620	2550
3000	3170	3120	3080	3040	3000	2930	2870	2800	2730
3200	3380	3340	3290	3250	3200	3130	3050	2980	2910
3400	3600	3550	3500	3450	3400	3320	3240	3160	3080
3600	3820	3770	3710	3660	3600	3520	3430	3350	3260
3800	4050	3980	3920	3860	3800	3710	3620	3520	3430
4000	4270	4200	4140	4070	4000	3900	3800	3700	3600
4200	4500	4420	4350	4270	4200	4090	3990	3880	3770
4400	4720	4640	4560	4480	4400	4280	4160	4040	3930
4600	4950	4860	4770	4690	4600	4470	4340	4210	4080
4800	5170	5080	4990	4890	4800	4660	4520	4380	4240
5000	5400	5300	5200	5100	5000	4850	4700	4540	4390

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	810	940	1070	1200	1250	1320	1400	1490
1400	990	1130	1260	1400	1460	1540	1630	1730
1600	1170	1310	1460	1600	1670	1760	1860	1960
1800	1350	1500	1650	1800	1890	1980	2090	2200
2000	1520	1680	1840	2000	2090	2190	2300	2430
2200	1680	1860	2030	2200	2290	2390	2520	2650
2400	1850	2030	2220	2400	2490	2600	2730	2880
2600	2010	2210	2400	2600	2700	2820	2950	3100
2800	2180	2380	2590	2800	2910	3030	3170	3330
3000	2340	2560	2780	3000	3120	3250	3390	3550
3200	2500	2740	2970	3200	3330	3470	3620	3780
3400	2670	2910	3160	3400	3540	3680	3840	4010
3600	2830	3090	3340	3600	3750	3900	4070	4240
3800	2990	3260	3530	3800	3950	4110	4280	4470
4000	3160	3440	3720	4000	4150	4320	4500	4700
4200	3320	3610	3910	4200	4360	4530	4710	4910
4400	3480	3790	4090	4400	4560	4730	4920	5120
4600	3640	3960	4280	4600	4770	4940	5130	5340
4800	3800	4130	4470	4800	4970	5150	5340	5550
5000	3960	4310	4650	5000	5180	5360	5560	5760

Takeoff Field & Climb Limit Weights

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	23	25	27	29	42	46	50
1220	191.2	172.9	171.8	170.6	170.3	169.8	169.2	168.7	157.3	152.6	148.1
1400	206.5	187.0	185.8	184.5	184.2	183.6	183.0	182.5	170.3	165.3	160.5
1600	221.9	201.3	200.0	198.7	198.4	197.7	197.1	196.5	183.6	178.4	173.3
1800	236.1	214.5	213.1	211.7	211.4	210.7	210.1	209.4	195.9	190.4	185.1
2000	249.2	226.7	225.3	223.9	223.5	222.8	222.1	221.5	207.4	201.7	196.1
2200	261.8	238.4	236.9	235.5	235.1	234.4	233.7	233.0	218.4	212.4	206.7
2400	273.4	249.2	247.6	246.1	245.7	245.0	244.3	243.5	228.4	222.3	216.3
2600	283.7	258.7	257.1	255.5	255.2	254.4	253.6	252.9	237.2	230.9	224.7
2800	293.7	267.9	266.2	264.6	264.2	263.4	262.6	261.9	245.7	239.2	232.8
3000	303.4	276.7	275.0	273.4	273.0	272.2	271.3	270.5	253.9	247.2	240.6
3200	312.4	285.1	283.4	281.7	281.3	280.4	279.6	278.8	261.8	254.8	248.1
3400	321.0	293.2	291.4	289.6	289.2	288.4	287.5	286.7	269.3	262.2	255.3
3600	324.3	300.8	299.0	297.2	296.8	295.9	295.0	294.2	276.4	269.2	262.2
3800	324.3	307.9	306.1	304.2	303.8	302.9	302.0	301.2	283.0	275.7	268.5
4000	324.3	314.7	312.8	311.0	310.5	309.6	308.7	307.9	289.4	281.9	274.6
4200	324.3	321.3	319.4	317.5	317.0	316.1	315.2	314.3	295.6	287.9	280.5
4400	324.3	324.3	324.3	323.8	323.3	322.4	321.5	320.5	301.5	293.7	286.2
4600	324.3	324.3	324.3	324.3	324.3	324.3	324.3	324.3	307.2	299.3	291.7
CLIMB LIMIT WT (1000 KG)	308.1	306.9	306.8	306.7	306.7	306.7	306.6	306.6	279.1	267.2	255.7

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	23	25	27	29	42	46	50
1220	179.4	162.2	161.1	160.0	159.8	159.2	158.1	156.8	146.0	141.6	136.8
1400	194.0	175.5	174.4	173.2	172.9	172.4	171.2	169.7	158.3	153.6	148.4
1600	208.7	189.2	187.9	186.7	186.4	185.8	184.6	183.0	170.9	165.9	160.4
1800	222.2	201.8	200.5	199.2	198.9	198.2	197.0	195.3	182.6	177.4	171.7
2000	234.7	213.5	212.1	210.8	210.5	209.8	208.5	206.8	193.6	188.1	182.1
2200	246.8	224.7	223.3	221.9	221.6	220.9	219.5	217.7	204.0	198.3	192.2
2400	257.8	234.9	233.5	232.1	231.7	231.0	229.6	227.7	213.5	207.6	201.2
2600	267.6	244.0	242.5	241.0	240.6	239.9	238.4	236.5	221.8	215.8	209.1
2800	277.1	252.7	251.2	249.6	249.3	248.5	247.0	245.0	229.9	223.6	216.7
3000	286.2	261.1	259.5	257.9	257.5	256.8	255.2	253.2	237.6	231.1	224.1
3200	294.9	269.1	267.5	265.9	265.5	264.7	263.1	261.0	245.0	238.4	231.2
3400	303.1	276.8	275.1	273.5	273.1	272.3	270.6	268.5	252.1	245.4	238.0
3600	311.0	284.1	282.4	280.7	280.3	279.4	277.7	275.6	258.9	252.0	244.4
3800	318.3	290.9	289.1	287.4	287.0	286.2	284.4	282.2	265.2	258.2	250.5
4000	324.3	297.4	295.6	293.9	293.4	292.6	290.8	288.6	271.3	264.1	256.3
4200	324.3	303.7	301.9	300.1	299.6	298.8	297.0	294.7	277.1	269.8	261.8
4400	324.3	309.7	307.9	306.1	305.6	304.8	302.9	300.6	282.7	275.3	267.2
4600	324.3	315.5	313.7	311.9	311.4	310.5	308.7	306.3	288.1	280.6	272.4
CLIMB LIMIT WT (1000 KG)	292.5	291.5	291.4	291.3	291.3	291.2	289.0	285.7	258.9	248.4	237.2

With engine bleed for packs off, increase field limit weight by 200 kg and climb limit weight by 900 kg.
With engine and wing anti-ice on, decrease field limit weight by 800 kg and climb limit weight by 1300 kg.

Takeoff Field & Climb Limit Weights
Flaps 15
4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	23	25	27	29	42	46	50
1220	167.2	151.1	150.1	148.8	148.2	147.1	145.9	144.5	133.4	129.8	126.4
1400	180.8	163.7	162.6	161.2	160.6	159.4	158.1	156.6	144.8	140.9	137.3
1600	194.8	176.6	175.5	174.0	173.4	172.1	170.7	169.1	156.6	152.5	148.7
1800	207.6	188.6	187.4	185.9	185.2	183.8	182.5	180.8	167.7	163.4	159.4
2000	219.6	199.8	198.5	196.9	196.2	194.8	193.4	191.6	178.0	173.5	169.3
2200	231.1	210.5	209.2	207.5	206.8	205.3	203.8	202.0	187.9	183.2	178.9
2400	241.5	220.2	218.9	217.2	216.4	214.9	213.3	211.4	196.8	192.0	187.5
2600	250.8	228.8	227.4	225.6	224.8	223.2	221.6	219.7	204.5	199.6	194.9
2800	259.7	237.0	235.6	233.7	232.9	231.3	229.6	227.6	212.0	206.9	202.1
3000	268.3	244.9	243.4	241.6	240.7	239.0	237.3	235.2	219.2	213.9	208.9
3200	276.5	252.5	251.0	249.1	248.2	246.5	244.8	242.6	226.2	220.7	215.7
3400	284.4	259.8	258.3	256.3	255.4	253.7	251.9	249.7	232.9	227.3	222.1
3600	291.8	266.8	265.2	263.2	262.3	260.5	258.7	256.4	239.2	233.6	228.3
3800	298.8	273.2	271.6	269.6	268.7	266.8	265.0	262.7	245.2	239.4	234.0
4000	305.4	279.4	277.8	275.7	274.8	272.9	271.0	268.7	250.9	245.0	239.5
4200	311.8	285.4	283.7	281.6	280.7	278.8	276.8	274.5	256.3	250.4	244.8
4400	318.0	291.1	289.5	287.3	286.3	284.4	282.5	280.1	261.6	255.6	249.9
4600	324.0	296.7	295.0	292.8	291.8	289.9	287.9	285.4	266.7	260.6	254.8
CLIMB LIMIT WT (1000 KG)	273.5	272.5	272.4	271.5	270.4	267.8	265.0	261.5	237.0	228.7	221.5

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	23	25	27	29	42	46	50
1220	155.4	140.2	139.0	137.4	137.0	135.6	134.2	132.8	122.8	119.7	116.5
1400	168.3	152.1	150.8	149.0	148.6	147.2	145.6	144.1	133.4	130.1	126.8
1600	181.5	164.3	162.9	161.1	160.7	159.1	157.5	155.9	144.6	141.1	137.5
1800	193.7	175.8	174.3	172.4	171.9	170.3	168.6	166.9	155.1	151.4	147.7
2000	205.1	186.4	184.9	182.9	182.4	180.7	179.0	177.2	164.9	161.0	157.2
2200	216.0	196.6	195.0	192.9	192.4	190.7	188.9	187.0	174.2	170.3	166.2
2400	226.0	205.8	204.2	202.0	201.5	199.7	197.8	195.9	182.6	178.5	174.4
2600	234.7	213.9	212.2	209.9	209.4	207.6	205.6	203.7	189.9	185.7	181.4
2800	243.1	221.6	219.9	217.6	217.0	215.1	213.1	211.1	196.9	192.6	188.1
3000	251.2	229.1	227.3	224.9	224.4	222.4	220.3	218.2	203.6	199.1	194.5
3200	259.0	236.3	234.5	232.0	231.5	229.4	227.3	225.2	210.2	205.6	200.9
3400	266.4	243.3	241.4	238.9	238.3	236.2	234.1	231.9	216.6	211.9	207.1
3600	273.5	249.8	247.9	245.4	244.8	242.7	240.5	238.2	222.6	217.8	212.9
3800	280.1	256.0	254.0	251.4	250.8	248.7	246.4	244.1	228.2	223.3	218.3
4000	286.4	261.9	259.9	257.2	256.6	254.4	252.1	249.8	233.6	228.6	223.5
4200	292.5	267.5	265.5	262.8	262.2	260.0	257.6	255.3	238.8	233.7	228.5
4400	298.4	273.0	270.9	268.2	267.6	265.3	262.9	260.5	243.8	238.6	233.4
4600	304.1	278.3	276.2	273.4	272.8	270.4	268.0	265.6	248.6	243.4	238.0
CLIMB LIMIT WT (1000 KG)	255.3	254.4	253.8	251.8	251.3	248.3	245.2	241.9	220.0	213.5	206.9

With engine bleed for packs off, increase field limit weight by 200 kg and climb limit weight by 900 kg.
With engine and wing anti-ice on, decrease field limit weight by 800 kg and climb limit weight by 1300 kg.

Takeoff Field & Climb Limit Weights
Flaps 15
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	23	25	27	29	42	46	50
1220	145.0	129.8	127.9	126.0	125.6	124.6	123.2	121.9	112.6	109.7	106.7
1400	157.2	140.9	138.9	136.9	136.4	135.3	133.9	132.5	122.6	119.5	116.2
1600	169.7	152.6	150.4	148.3	147.8	146.6	145.1	143.6	133.1	129.8	126.4
1800	181.4	163.4	161.1	158.9	158.4	157.2	155.6	154.0	143.0	139.6	136.0
2000	192.3	173.5	171.1	168.9	168.3	167.0	165.4	163.7	152.3	148.7	145.0
2200	202.7	183.2	180.7	178.4	177.8	176.5	174.8	173.1	161.2	157.5	153.6
2400	212.1	192.0	189.4	187.0	186.4	185.0	183.3	181.4	169.1	165.3	161.3
2600	220.4	199.6	196.9	194.4	193.8	192.4	190.6	188.7	176.0	172.0	167.9
2800	228.4	206.9	204.1	201.5	200.9	199.4	197.6	195.6	182.5	178.4	174.2
3000	236.0	213.9	211.1	208.4	207.7	206.2	204.3	202.3	188.8	184.6	180.2
3200	243.4	220.7	217.8	215.1	214.5	212.9	210.9	208.9	195.0	190.7	186.2
3400	250.5	227.3	224.4	221.6	220.9	219.3	217.3	215.2	201.0	196.6	192.0
3600	257.3	233.6	230.6	227.7	227.0	225.4	223.3	221.2	206.8	202.2	197.5
3800	263.6	239.4	236.3	233.4	232.7	231.1	229.0	226.8	212.1	207.5	202.7
4000	269.6	245.0	241.8	238.9	238.2	236.5	234.4	232.1	217.2	212.5	207.6
4200	275.4	250.4	247.2	244.2	243.4	241.7	239.6	237.3	222.1	217.3	212.3
4400	281.0	255.6	252.3	249.3	248.5	246.8	244.6	242.3	226.8	221.9	216.9
4600	286.4	260.6	257.3	254.2	253.4	251.6	249.4	247.1	231.4	226.4	221.3
CLIMB LIMIT WT (1000 KG)	240.1	238.8	235.4	232.5	231.8	229.6	226.6	223.4	203.7	197.6	191.2

With engine bleed for packs off, increase field limit weight by 200 kg and climb limit weight by 900 kg.
With engine and wing anti-ice on, decrease field limit weight by 800 kg and climb limit weight by 1300 kg.

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Sea Level, 30°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	242.9	265.1	283.9	300.0	311.5	319.5					
20	227.1	247.3	264.6	279.1	291.3	301.5	309.7	315.4			
40	211.2	229.8	246.0	259.8	272.3	282.9	291.9	299.6	306.0	310.9	314.9
60	197.6	216.2	231.6	245.9	258.3	269.0	278.1	285.9	292.7	298.6	303.7
80	186.4	204.6	220.8	234.7	246.8	257.4	266.6	274.6	281.6	287.7	293.1
100	176.6	195.2	211.4	224.9	236.9	247.4	256.6	264.7	271.9	278.2	283.8
120	168.6	187.0	202.8	216.4	228.1	238.6	247.8	256.0	263.2	269.7	275.5
140	161.7	179.6	195.1	208.7	220.3	230.6	239.9	248.1	255.4	262.0	267.9
160		172.9	188.2	201.5	213.3	223.4	232.6	240.9	248.2	254.9	260.9
180		166.8	181.8	195.0	206.6	216.9	225.9	234.2	241.6	248.4	254.4
200		161.1	175.9	188.9	200.5	210.8	219.8	228.0	235.5	242.3	248.4
220		156.4	170.5	183.4	194.8	205.0	214.2	222.3	229.7	236.5	242.8
240		154.4	165.5	178.1	189.4	199.6	208.8	216.9	224.3	231.2	237.4
260			160.8	173.3	184.5	194.5	203.7	211.9	219.3	226.1	232.4
280			155.9	168.7	179.8	189.8	198.8	207.1	214.6	221.3	227.6
300			154.2	164.4	175.4	185.3	194.3	202.5	210.0	216.8	223.0

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
29 & Below	0	0	0	0	0	0	0	0
30	-1.1	-1.2	-1.3	-1.4	-1.6	-1.7	-1.8	-1.9
32	-3.2	-3.6	-3.9	-4.3	-4.7	-5.0	-5.4	-5.7
34	-5.3	-6.0	-6.6	-7.2	-7.8	-8.4	-9.0	-9.6
36	-7.5	-8.3	-9.2	-10.0	-10.9	-11.7	-12.5	-13.4
38	-9.6	-10.7	-11.8	-12.9	-14.0	-15.0	-16.1	-17.2
40	-11.8	-13.1	-14.4	-15.7	-17.1	-18.4	-19.7	-21.0
42	-15.1	-16.8	-18.5	-20.2	-21.8	-23.5	-25.2	-26.9
44	-18.5	-20.5	-22.5	-24.6	-26.6	-28.7	-30.7	-32.7
46	-21.8	-24.2	-26.6	-29.0	-31.4	-33.8	-36.2	-38.6
48	-25.1	-27.9	-30.7	-33.4	-36.2	-38.9	-41.7	-44.4
50	-28.5	-31.6	-34.7	-37.8	-40.9	-44.0	-47.2	-50.3

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
S.L. & Below	0	0	0	0	0	0	0	0
1000	-6.5	-7.2	-7.8	-8.4	-9.1	-9.7	-10.3	-10.9
2000	-13.1	-14.4	-15.6	-16.9	-18.1	-19.4	-20.6	-21.9
3000	-20.2	-22.2	-24.1	-26.1	-28.1	-30.1	-32.0	-34.0
4000	-27.3	-30.0	-32.7	-35.4	-38.0	-40.7	-43.4	-46.1
5000	-33.4	-36.9	-40.3	-43.8	-47.3	-50.7	-54.2	-57.7
6000	-39.5	-43.8	-48.0	-52.2	-56.5	-60.8	-65.0	-69.2
7000	-45.5	-50.5	-55.5	-60.5	-65.5	-70.5	-75.5	-80.5
8000	-51.5	-57.2	-63.0	-68.8	-74.5	-80.2	-86.0	-91.8

Takeoff Obstacle Limit Weight

Flaps 15

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
15 TW	-26.1	-26.1	-26.1	-26.2	-26.2	-26.2	-26.3	-26.3
10 TW	-17.4	-17.4	-17.4	-17.4	-17.5	-17.5	-17.5	-17.5
5 TW	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.8	-8.8
0	0	0	0	0	0	0	0	0
10 HW	3.0	2.8	2.5	2.2	2.0	2.1	2.2	2.4
20 HW	6.0	5.5	5.0	4.5	4.0	4.2	4.5	4.8
30 HW	9.2	8.6	8.0	7.4	6.8	6.6	6.4	6.2
40 HW	12.4	11.7	11.0	10.3	9.6	9.0	8.3	7.6

With engine bleed for packs off, increase weight by 300 kg.
With engine and wing anti-ice on, decrease weight by 1500 kg.

Tire Speed Limit

Flaps 15

AIRPORT		TIRE SPEED LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
(°C)	(°F)	-2000	0	2000	4000	6000	8000
54	129	324.3	318.0	295.3	273.0	252.2	232.9
52	126	324.3	319.7	297.1	274.7	253.7	234.3
50	122	324.3	321.5	298.9	276.3	255.2	235.7
48	118	324.3	322.6	300.6	278.0	256.8	237.1
46	115	324.3	323.7	302.3	279.8	258.4	238.6
44	111	324.3	324.3	304.0	281.5	260.0	240.1
42	108	324.3	324.3	305.8	283.2	261.7	241.6
40	104	324.3	324.3	307.5	285.0	263.3	243.1
38	100	324.3	324.3	309.4	286.8	265.0	244.7
36	97	324.3	324.3	311.2	288.6	266.7	246.2
34	93	324.3	324.3	313.1	290.5	268.4	247.8
32	90	324.3	324.3	315.1	292.4	270.2	249.4
30	86	324.3	324.3	317.1	294.3	271.9	251.1
28	82	324.3	324.3	319.1	296.3	273.7	252.7
26	79	324.3	324.3	321.2	298.3	275.6	254.4
24	75	324.3	324.3	323.3	300.4	277.5	256.1
22	72	324.3	324.3	324.3	302.4	279.5	258.0
20	68	324.3	324.3	324.3	304.5	281.5	259.8
18	64	324.3	324.3	324.3	306.7	283.6	261.7
16	61	324.3	324.3	324.3	308.9	285.7	263.6
14	57	324.3	324.3	324.3	311.1	287.9	265.5
12	54	324.3	324.3	324.3	313.4	290.1	267.6
10	50	324.3	324.3	324.3	315.7	292.4	269.7
-40	-40	324.3	324.3	324.3	324.3	324.3	324.3

Increase tire speed limit weight by 2400 kg per knot headwind.
Decrease tire speed limit weight by 3000 kg per knot tailwind.

Brake Energy Limits VMBE

Maximum Brake Energy Speed

OAT (°C)	REFERENCE VMBE (KIAS)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	198	191				
50	199	191	185			
46	199	192	185	179		
42	200	193	186	179	173	
38	201	193	187	180	174	164
34	202	194	187	181	175	166
30	204	195	188	182	175	167
26	205	197	189	183	176	169
22	207	198	191	184	177	170
18	209	200	192	185	179	172
14	210	202	194	187	180	173
10	210	203	196	189	182	175
6	210	205	197	190	183	176
2	210	207	199	192	185	178
-2	210	209	201	194	186	179
-6	210	210	203	195	188	181
-10	210	210	205	197	190	183

Weight Adjusted VMBE

WEIGHT (1000 KG)	REFERENCE VMBE (KIAS)										
	160	165	170	175	180	185	190	195	200	205	210
180	186	193	200	207	210	210	210	210	210	210	210
200	177	182	188	194	200	206	210	210	210	210	210
220	168	173	178	184	189	194	200	205	210	210	210
240	160	165	170	175	180	185	190	195	200	205	210
260	153	158	163	167	172	177	181	186	191	195	200
280	148	152	156	161	165	170	174	178	183	187	192
300	143	147	151	155	160	164	168	172	176	180	184

Increase VMBE by 3 knots per 1% uphill runway slope. Decrease VMBE by 5 knots per 1% downhill runway slope.
Increase VMBE by 5 knot per 10 knots headwind. Decrease VMBE by 21 knots per 10 knots tailwind.
Decrease VMBE by 10 knots for one brake deactivated and 21 knots for two brakes deactivated.
Decrease brake release weight by 1500 kg for each knot V1 exceeds VMBE.
Determine normal V1, VR, V2 speeds for lower brake release weight.

Takeoff Speeds
Flaps 15
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
320	174	183	187
310	170	179	184
300	167	176	181
290	163	173	179
280	160	169	176
270	157	166	173
260	153	163	171
250	149	159	168
240	146	156	165
230	142	152	162
220	137	148	158
210	133	144	155
200	129	140	152
190	123	136	148
180	119	131	145
170	114	127	141
160	108	122	137

Check V1(MCG) and minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	8	10	12	14			4	4	5	6			-2	-2	-3	-3		
50	122	5	6	9	11	14	16	2	3	4	5	6	7	-1	-1	-2	-2	-3	-3
40	104	1	3	5	9	11	13	1	1	3	4	5	6	0	-1	-1	-2	-2	-3
30	86	0	0	3	6	9	11	0	0	1	3	4	5	0	0	-1	-1	-2	-2
20	68	0	0	2	4	7	10	0	0	1	2	3	5	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	7	9	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
320	-6	-3	0	3	5	-4	-2	-1	0	0	1	1	2
300	-5	-2	0	3	5	-3	-2	-1	0	0	1	1	2
280	-4	-2	0	3	4	-2	-1	0	0	0	1	1	2
260	-3	-1	0	3	4	-1	-1	0	0	1	2	2	2
240	-3	-1	0	2	4	-1	-1	0	0	1	2	2	2
220	-2	-1	0	2	4	-1	-1	0	0	1	2	2	2
200	-2	-1	0	2	4	-1	-1	0	0	1	2	2	3
180	-2	-1	0	2	4	-1	-1	0	0	1	2	2	3
160	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3

***V1 not to exceed VR**

Takeoff Speeds
Flaps 15
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	101	105	98	102	96	101	94	100				
50	122	103	108	100	105	96	101	94	100	93	98	90	96
40	104	108	112	106	110	102	107	97	102	93	99	90	96
30	86	110	114	109	114	105	110	101	106	97	102	93	98
20	68	110	114	110	114	106	111	103	108	99	104	95	100
-60	-76	111	115	111	114	107	111	104	108	100	105	97	102

Intentionally
Blank

Performance Dispatch — Chapter PD
Enroute — Section 31

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	29700	0	33500*	33500*	33500*	33500*	32100
290	30500	-2	34300*	34300*	34300*	34300	32900
280	31200	-4	35200*	35200*	35200*	35100	33600
270	32000	-5	36100*	36100*	36100*	35800	34400
260	32800	-7	36700*	36700*	36700*	36600	35200
250	33700	-9	37500*	37500*	37500*	37400	36000
240	34500	-11	38300*	38300*	38300*	38300	36800
230	35400	-13	39100*	39100*	39100*	39100*	37700
220	36400	-15	40000*	40000*	40000*	40000*	38700
210	37300	-15	41000*	41000*	41000*	41000	39600
200	38300	-15	41900*	41900*	41900*	41900*	40600
190	39400	-15	42900*	42900*	42900*	42900*	41700
180	40500	-15	43100	43100	43100	43100	42800
170	41700	-15	43100	43100	43100	43100	43100
160	43000	-15	43100	43100	43100	43100	43100

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	29700	5	32400*	32400*	32400*	32400*	32100
290	30500	4	33300*	33300*	33300*	33300*	32900
280	31200	2	34200*	34200*	34200*	34200*	33600
270	32000	0	35100*	35100*	35100*	35100*	34400
260	32800	-2	36100*	36100*	36100*	36100*	35200
250	33700	-3	36700*	36700*	36700*	36700*	36000
240	34500	-5	37500*	37500*	37500*	37500*	36800
230	35400	-7	38300*	38300*	38300*	38300*	37700
220	36400	-9	39200*	39200*	39200*	39200*	38700
210	37300	-9	40100*	40100*	40100*	40100*	39600
200	38300	-9	41100*	41100*	41100*	41100*	40600
190	39400	-9	42100*	42100*	42100*	42100*	41700
180	40500	-9	43100	43100	43100	43100	42800
170	41700	-9	43100	43100	43100	43100	43100
160	43000	-9	43100	43100	43100	43100	43100

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	29700	11	30900*	30900*	30900*	30900*	30900*
290	30500	9	31900*	31900*	31900*	31900*	31900*
280	31200	8	32900*	32900*	32900*	32900*	32900*
270	32000	6	33800*	33800*	33800*	33800*	33800*
260	32800	4	34800*	34800*	34800*	34800*	34800*
250	33700	2	35800*	35800*	35800*	35800*	35800*
240	34500	0	36500*	36500*	36500*	36500*	36500*
230	35400	-2	37400*	37400*	37400*	37400*	37400*
220	36400	-3	38200*	38200*	38200*	38200*	38200*
210	37300	-3	39100*	39100*	39100*	39100*	39100*
200	38300	-3	40000*	40000*	40000*	40000*	40000*
190	39400	-3	41000*	41000*	41000*	41000*	41000*
180	40500	-3	42100*	42100*	42100*	42100*	42100*
170	41700	-3	43100	43100	43100	43100	43100
160	43000	-3	43100	43100	43100	43100	43100

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
661	621	586	554	526	500	478	458	440	423	408
1310	1235	1166	1105	1050	1000	958	919	883	851	821
1956	1845	1744	1654	1574	1500	1438	1381	1328	1279	1234
2600	2454	2322	2204	2098	2000	1919	1843	1772	1708	1648
3242	3062	2899	2753	2621	2500	2399	2305	2217	2136	2062
3881	3669	3474	3301	3144	3000	2879	2766	2662	2565	2476
4518	4272	4048	3848	3667	3500	3359	3228	3106	2993	2890
5153	4875	4621	4394	4189	4000	3840	3690	3551	3422	3304
5786	5477	5194	4941	4711	4500	4320	4152	3995	3851	3718
6419	6079	5766	5487	5234	5000	4800	4613	4440	4279	4132
7052	6680	6339	6033	5756	5500	5280	5075	4884	4708	4546
7684	7281	6911	6579	6278	6000	5761	5537	5329	5137	4960
8316	7881	7483	7125	6800	6500	6241	5999	5774	5565	5374
8948	8482	8055	7670	7322	7000	6721	6460	6218	5994	5788
9580	9083	8627	8216	7844	7500	7201	6922	6663	6423	6202
10213	9684	9199	8762	8366	8000	7682	7384	7107	6851	6616

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	27		29		31		33		35	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	8.7	1:17	8.6	1:16	8.5	1:15	8.4	1:14	8.3	1:13
1000	16.4	2:26	16.0	2:24	15.7	2:21	15.5	2:19	15.3	2:17
1500	24.3	3:34	23.7	3:30	23.2	3:26	22.8	3:22	22.4	3:19
2000	32.2	4:42	31.3	4:36	30.6	4:30	30.1	4:25	29.6	4:22
2500	40.5	5:47	39.4	5:40	38.5	5:34	37.8	5:28	37.1	5:25
3000	48.7	6:53	47.4	6:45	46.4	6:37	45.5	6:30	44.6	6:27
3500	57.3	7:58	55.8	7:48	54.6	7:39	53.5	7:32	52.7	7:29
4000	65.9	9:02	64.2	8:51	62.8	8:41	61.6	8:34	60.7	8:31
4500	75.0	10:05	73.0	9:53	71.4	9:43	70.1	9:36	69.3	9:34
5000	84.0	11:08	81.9	10:55	80.0	10:45	78.6	10:38	77.9	10:36
5500	93.4	12:11	91.1	11:56	89.1	11:46	87.7	11:39		
6000	102.8	13:14	100.3	12:58	98.2	12:47	96.8	12:41		
6500	112.6	14:16	110.0	13:59	107.8	13:48	106.7	13:43		
7000	122.5	15:19	119.6	15:00	117.5	14:50	116.6	14:45		
7500	132.7	16:22	129.8	16:01	127.9	15:51				
8000	142.9	17:24	140.0	17:02	138.3	16:52				

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
10	-1.0	-0.5	0.0	0.7	1.4
20	-2.0	-1.1	0.0	1.4	3.1
30	-3.1	-1.6	0.0	2.2	5.1
40	-4.1	-2.2	0.0	3.2	7.3
50	-5.2	-2.8	0.0	4.3	9.9
60	-6.3	-3.3	0.0	5.5	12.7
70	-7.4	-3.9	0.0	6.8	15.8
80	-8.5	-4.5	0.0	8.3	19.2
90	-9.6	-5.0	0.0	9.8	22.9
100	-10.8	-5.6	0.0	11.5	26.9
110	-11.9	-6.2	0.0	13.3	31.2
120	-13.1	-6.8	0.0	15.3	35.8
130	-14.3	-7.3	0.0	17.3	40.6
140	-15.5	-7.9	0.0	19.5	45.7
150	-16.7	-8.5	0.0	21.8	51.2

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1293	1221	1157	1100	1047	1000	957	917	880	847	815
1924	1821	1729	1645	1569	1500	1437	1378	1325	1275	1229
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643
3186	3020	2871	2736	2612	2500	2397	2302	2214	2133	2057
3817	3620	3442	3281	3134	3000	2877	2763	2659	2562	2471
4447	4219	4013	3826	3656	3500	3357	3225	3103	2990	2885
5078	4818	4584	4371	4177	4000	3837	3687	3548	3419	3300
5708	5417	5155	4916	4699	4500	4317	4149	3993	3848	3714
6339	6017	5726	5461	5221	5000	4797	4610	4438	4277	4128
6969	6616	6297	6007	5742	5500	5277	5072	4882	4706	4542
7600	7215	6868	6552	6264	6000	5758	5534	5327	5135	4956
8231	7815	7439	7097	6785	6500	6238	5996	5772	5564	5370
8862	8415	8010	7642	7307	7000	6718	6457	6216	5993	5784
9494	9015	8581	8188	7829	7500	7198	6919	6661	6421	6198
10126	9615	9153	8733	8351	8000	7678	7380	7105	6850	6612

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)					TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)					
	160	180	200	220	240	
1000	12.9	14.1	15.3	16.5	17.8	2:16
1500	18.7	20.4	22.4	24.1	26.1	3:18
2000	24.7	27.0	29.7	32.0	34.7	4:21
2500	30.8	33.9	37.1	40.2	43.5	5:23
3000	37.1	40.9	44.8	48.6	52.6	6:25
3500	43.6	48.1	52.7	57.2	61.9	7:27
4000	50.2	55.5	60.8	66.1	71.5	8:29
4500	57.2	63.1	69.3	75.2	81.4	9:32
5000	64.3	70.9	77.9	84.6	91.5	10:34
5500	71.6	79.0	86.8	94.3	101.9	11:36
6000	79.1	87.4	96.0	104.3	112.7	12:38
6500	86.8	96.0	105.4	114.5	123.8	13:40
7000	94.8	104.9	115.1	125.0	135.5	14:43
7500	103.0	114.0	125.1	135.9	147.7	15:45
8000	111.5	123.3	135.3	147.2	160.4	16:48

Based on 310/.84 climb, LRC and .84/310/250 descent.
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
89	77	68	61	55	50	46	43	40	37	35
156	140	127	117	108	100	93	87	82	78	74
221	202	186	172	160	150	141	133	126	119	114
285	262	243	227	213	200	189	179	170	162	154
347	322	300	281	265	250	237	225	214	204	195
409	381	357	336	317	300	285	271	259	247	237
471	440	414	390	369	350	333	317	303	290	279
533	499	470	444	421	400	381	364	348	334	320
595	559	527	499	473	450	429	410	392	376	362
660	620	585	554	525	500	477	456	437	419	403

Trip Fuel and Time Required

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	0:13
	ALT (FT)	9000	9000	9000	9000	7000	
100	FUEL (1000 KG)	2.3	2.4	2.6	2.7	2.9	0:21
	ALT (FT)	15000	17000	13000	13000	13000	
150	FUEL (1000 KG)	3.1	3.2	3.4	3.6	3.8	0:29
	ALT (FT)	23000	23000	21000	21000	21000	
200	FUEL (1000 KG)	3.8	4.0	4.2	4.5	4.7	0:36
	ALT (FT)	31000	29000	27000	25000	25000	
250	FUEL (1000 KG)	4.4	4.7	5.0	5.3	5.6	0:42
	ALT (FT)	35000	33000	31000	29000	27000	
300	FUEL (1000 KG)	4.9	5.3	5.7	6.0	6.4	0:48
	ALT (FT)	37000	37000	35000	33000	31000	
350	FUEL (1000 KG)	5.5	5.9	6.3	6.7	7.2	0:54
	ALT (FT)	41000	39000	37000	35000	33000	
400	FUEL (1000 KG)	6.0	6.5	7.0	7.5	8.0	1:00
	ALT (FT)	41000	39000	37000	35000	33000	
450	FUEL (1000 KG)	6.6	7.1	7.7	8.2	8.8	1:06
	ALT (FT)	41000	39000	37000	35000	33000	
500	FUEL (1000 KG)	7.2	7.7	8.3	8.9	9.6	1:13
	ALT (FT)	43000	39000	37000	35000	33000	

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	8680	8600	8410	8450	8810	8990	9400			
280	8120	8030	7830	7800	8080	8300	8590	9090		
260	7580	7470	7440	7180	7350	7630	7880	8170		
240	7180	6930	7000	6730	6810	6990	7140	7490		
220	6640	6530	6440	6170	6170	6250	6450	6680	7260	
200	6110	6000	5900	5770	5590	5670	5800	5980	6380	
180	5730	5480	5380	5240	5180	5030	5110	5270	5640	5880
160	5210	5090	4870	4720	4650	4490	4510	4710	4970	5140

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	9280	8990	9040	8990	9060
280	8650	8570	8380	8330	8370
260	8020	7930	7720	7650	7680
240	7400	7300	7260	7130	7140
220	6920	6830	6770	6500	6500
200	6320	6240	6170	5890	5860
180	5730	5650	5580	5450	5260
160	5300	5190	5000	4870	4790

Crew Oxygen Requirements
Required Pressure (PSI) for One 114/115 Cubic Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	530	735	945
45	113	520	725	930
40	104	510	715	915
35	95	505	700	900
30	86	495	690	885
25	77	485	680	870
20	68	480	670	860
15	59	470	655	840
10	50	460	645	830
5	41	455	635	815
0	32	445	620	800
-5	23	440	610	785
-10	14	430	600	770

For more extensive than normal crew usage, add 1.2 psi/person/minute.

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
26	172.8	164.7	156.5
24	189.1	180.7	171.8
22	205.7	196.7	186.8
20	223.5	213.8	203.0
18	241.3	231.2	219.8
16	260.2	249.6	237.8
14	276.5	265.5	252.6
12	293.2	281.6	267.6
10	308.8	295.5	279.9
8	322.8	308.2	290.9
6	324.3	319.6	301.7

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	8	10	12	14	16	18	20	22	24
ENGINE ONLY	-3.9	-4.4	-3.6	-3.1	-2.6	-1.8	-1.2	-1.4	-1.1
ENGINE AND WING	-5.3	-5.7	-5.0	-4.6	-4.0	-3.3	-2.9	-3.1	-2.8

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
281	260	242	226	212	200	189	179	170	162	155
568	524	486	454	425	400	378	358	340	324	309
854	787	730	681	638	600	566	536	509	485	463
1140	1051	974	908	851	800	755	715	679	646	616
1426	1314	1219	1136	1064	1000	944	893	848	807	770
1713	1578	1463	1363	1276	1200	1132	1072	1017	968	924
1999	1841	1707	1591	1489	1400	1321	1250	1187	1129	1077
2285	2105	1951	1818	1702	1600	1509	1429	1356	1290	1231
2571	2368	2195	2045	1915	1800	1698	1607	1525	1452	1385
2858	2632	2439	2273	2128	2000	1887	1786	1695	1613	1538
3144	2895	2683	2500	2341	2200	2075	1964	1864	1774	1692
3430	3159	2928	2728	2553	2400	2264	2143	2034	1935	1846
3716	3423	3172	2955	2766	2600	2453	2321	2203	2096	1999
4003	3686	3416	3182	2979	2800	2641	2500	2372	2257	2153
4289	3950	3660	3410	3192	3000	2830	2678	2542	2419	2307

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.5	4.7	4.9	5.1	5.3	5.5	5.7	5.9
400	8.2	8.6	8.9	9.2	9.6	10.0	10.3	10.7
600	11.9	12.4	12.9	13.4	13.8	14.3	14.8	15.4
800	15.6	16.3	16.9	17.5	18.1	18.7	19.3	20.0
1000	19.2	20.1	20.9	21.6	22.3	23.0	23.8	24.7
1200	22.8	23.9	24.8	25.7	26.5	27.4	28.3	29.3
1400	26.3	27.6	28.7	29.7	30.7	31.6	32.7	33.8
1600	29.9	31.3	32.5	33.7	34.8	35.9	37.0	38.3
1800	33.4	35.0	36.4	37.7	38.9	40.1	41.4	42.8
2000	37.0	38.6	40.2	41.7	43.0	44.4	45.8	47.3
2200	40.5	42.2	44.0	45.6	47.1	48.5	50.0	51.7
2400	44.0	45.7	47.7	49.5	51.1	52.6	54.3	56.0
2600	47.6	49.3	51.4	53.3	55.1	56.8	58.5	60.4
2800	51.1	52.8	55.1	57.2	59.1	60.9	62.8	64.8
3000	54.7	56.4	58.7	61.0	63.0	64.9	67.0	69.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (4%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engine cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	261	243	227	212	200	189	179	170	162	155
574	528	489	455	426	400	377	357	338	322	307
866	795	735	684	639	600	565	534	507	482	459
1157	1062	982	913	853	800	753	712	675	642	611
1449	1329	1228	1141	1066	1000	942	890	843	801	763
1740	1597	1475	1370	1279	1200	1130	1067	1012	961	916
2032	1864	1721	1599	1493	1400	1318	1245	1180	1121	1068
2323	2131	1968	1828	1706	1600	1506	1423	1348	1281	1220
2615	2398	2214	2056	1920	1800	1694	1601	1516	1441	1372
2906	2665	2460	2285	2133	2000	1883	1778	1685	1601	1525
3198	2932	2707	2514	2346	2200	2071	1956	1853	1761	1677
3489	3199	2953	2742	2560	2400	2259	2134	2021	1920	1829
3781	3466	3200	2971	2773	2600	2447	2311	2190	2080	1981
4072	3733	3446	3200	2987	2800	2635	2489	2358	2240	2133
4364	4000	3692	3429	3200	3000	2824	2667	2526	2400	2286

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.1	4.3	4.5	4.9	5.1	5.4	5.6	5.9
400	7.4	7.9	8.3	8.8	9.3	9.8	10.3	10.8
600	10.8	11.4	12.1	12.8	13.5	14.2	14.9	15.5
800	14.2	15.0	15.8	16.7	17.6	18.5	19.4	20.2
1000	17.5	18.6	19.6	20.7	21.8	22.9	23.9	24.9
1200	20.7	22.0	23.2	24.5	25.9	27.2	28.4	29.6
1400	23.8	25.3	26.8	28.3	29.8	31.3	32.7	34.1
1600	27.0	28.7	30.4	32.1	33.8	35.5	37.1	38.6
1800	30.1	32.1	33.9	35.8	37.7	39.6	41.4	43.2
2000	33.3	35.5	37.5	39.6	41.7	43.8	45.7	47.7
2200	36.5	38.7	40.9	43.2	45.5	47.7	49.9	52.0
2400	39.6	41.9	44.3	46.8	49.3	51.7	54.1	56.4
2600	42.8	45.0	47.7	50.4	53.0	55.6	58.2	60.7
2800	46.0	48.2	51.1	53.9	56.8	59.6	62.4	65.0
3000	49.1	51.3	54.4	57.5	60.6	63.5	66.4	69.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
263	247	233	221	210	200	190	182	174	167	161
528	496	468	442	420	400	381	364	349	334	321
794	746	703	665	630	600	571	546	523	501	481
1062	997	939	887	841	800	762	727	696	667	641
1332	1249	1176	1110	1052	1000	952	909	869	833	800
1603	1502	1413	1334	1263	1200	1142	1090	1042	998	958
1875	1756	1651	1558	1474	1400	1332	1271	1215	1163	1116
2148	2010	1889	1782	1686	1600	1522	1451	1387	1328	1274
2422	2265	2128	2006	1897	1800	1712	1632	1559	1493	1431
2697	2521	2367	2230	2109	2000	1901	1812	1731	1657	1589
2972	2777	2606	2455	2320	2200	2091	1992	1903	1821	1746
3247	3033	2845	2679	2532	2400	2280	2173	2074	1985	1903
3523	3289	3085	2904	2743	2600	2470	2353	2246	2149	2060
3799	3546	3324	3129	2955	2800	2660	2533	2418	2313	2216
4075	3802	3564	3353	3167	3000	2849	2713	2590	2477	2373

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG) 160	180	200	220	240	260	280	300
200	4.2	4.4	4.7	4.9	5.1	5.3	5.6	5.8
400	6.9	7.4	7.9	8.4	9.0	9.5	10.0	10.5
600	9.5	10.3	11.1	11.9	12.7	13.5	14.4	15.1
800	12.0	13.1	14.2	15.3	16.4	17.5	18.6	19.6
1000	14.5	15.9	17.3	18.7	20.0	21.5	22.9	24.1
1200	17.0	18.7	20.3	22.0	23.6	25.4	27.0	28.5
1400	19.5	21.4	23.3	25.3	27.2	29.2	31.2	32.9
1600	21.9	24.1	26.3	28.6	30.7	33.0	35.3	37.3
1800	24.3	26.8	29.3	31.8	34.2	36.8	39.3	41.6
2000	26.6	29.4	32.2	35.0	37.7	40.5	43.4	45.8
2200	29.0	32.0	35.1	38.1	41.1	44.2	47.3	50.0
2400	31.3	34.6	37.9	41.2	44.5	47.9	51.3	54.2
2600	33.6	37.2	40.8	44.3	47.9	51.5	55.1	58.3
2800	35.9	39.7	43.6	47.4	51.2	55.1	59.0	62.4
3000	38.1	42.2	46.3	50.4	54.4	58.6	62.8	66.5

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - 320 KIAS Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
292	267	246	229	213	200	188	178	168	160	152
566	523	485	453	425	400	378	358	340	324	309
840	778	724	678	636	600	568	538	512	488	467
1115	1034	963	902	848	800	757	719	684	653	624
1390	1289	1202	1126	1059	1000	947	899	856	817	781
1664	1545	1441	1351	1271	1200	1137	1080	1028	981	938
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1096
2213	2056	1919	1799	1694	1600	1516	1440	1372	1310	1253
2488	2311	2158	2024	1905	1800	1706	1621	1544	1474	1410
2763	2567	2397	2248	2117	2000	1895	1801	1716	1638	1567
3037	2822	2636	2473	2328	2200	2085	1981	1888	1802	1725
3312	3078	2875	2697	2540	2400	2275	2162	2060	1967	1882
3587	3334	3114	2921	2751	2600	2464	2342	2232	2131	2039
3861	3589	3353	3146	2963	2800	2654	2523	2404	2295	2196
4136	3845	3592	3370	3174	3000	2844	2703	2576	2460	2354

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.4	4.6	4.7	4.9	5.2	5.4	5.6	5.9
400	8.3	8.5	8.8	9.1	9.4	9.9	10.3	10.8
600	12.2	12.5	12.8	13.2	13.7	14.2	14.8	15.5
800	16.1	16.4	16.9	17.4	17.9	18.6	19.4	20.2
1000	19.9	20.4	20.9	21.5	22.2	23.0	23.9	24.9
1200	23.7	24.3	24.9	25.6	26.4	27.3	28.4	29.5
1400	27.6	28.2	28.9	29.6	30.5	31.6	32.8	34.1
1600	31.4	32.1	32.8	33.7	34.7	35.8	37.1	38.6
1800	35.3	35.9	36.8	37.8	38.8	40.1	41.5	43.1
2000	39.1	39.8	40.7	41.8	42.9	44.3	45.9	47.6
2200	42.9	43.6	44.6	45.7	47.0	48.4	50.1	52.0
2400	46.8	47.5	48.5	49.7	51.1	52.6	54.4	56.4
2600	50.6	51.3	52.4	53.7	55.1	56.7	58.6	60.8
2800	54.4	55.1	56.3	57.6	59.2	60.9	62.9	65.1
3000	58.3	59.0	60.1	61.5	63.2	65.0	67.1	69.4

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - .84M/320KIAS Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
258	244	231	219	209	200	191	183	176	169	163
518	489	463	440	419	400	382	366	351	338	325
779	735	696	660	628	600	573	549	527	506	487
1041	982	929	881	838	800	764	732	702	674	649
1303	1229	1162	1102	1048	1000	955	914	877	842	811
1566	1476	1396	1323	1258	1200	1146	1097	1052	1010	972
1830	1724	1629	1545	1469	1400	1337	1279	1226	1178	1133
2093	1972	1863	1766	1679	1600	1527	1462	1401	1346	1294
2357	2219	2097	1987	1889	1800	1718	1644	1576	1513	1455
2620	2467	2331	2209	2099	2000	1909	1826	1751	1681	1617
2883	2715	2564	2430	2309	2200	2100	2009	1925	1849	1778
3146	2962	2798	2651	2519	2400	2291	2191	2100	2017	1939
3408	3208	3031	2872	2729	2600	2482	2374	2276	2185	2101
3669	3454	3264	3093	2939	2800	2673	2557	2451	2353	2263
3929	3700	3496	3313	3149	3000	2864	2740	2627	2522	2426

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.5	4.6	4.7	4.9	5.1	5.2	5.4	5.6
400	7.9	8.1	8.4	8.7	9.1	9.4	9.8	10.2
600	11.3	11.6	12.0	12.5	13.0	13.6	14.2	14.9
800	14.7	15.1	15.6	16.2	16.8	17.6	18.4	19.3
1000	18.0	18.5	19.1	19.8	20.6	21.6	22.6	23.8
1200	21.4	22.0	22.6	23.5	24.4	25.5	26.8	28.1
1400	24.7	25.4	26.1	27.1	28.2	29.5	30.9	32.5
1600	28.0	28.8	29.6	30.7	31.9	33.4	35.0	36.8
1800	31.4	32.1	33.1	34.3	35.6	37.3	39.1	41.1
2000	34.7	35.5	36.6	37.8	39.3	41.1	43.1	45.3
2200	38.0	38.9	40.0	41.4	43.0	44.9	47.1	49.5
2400	41.3	42.2	43.4	44.9	46.7	48.7	51.1	53.7
2600	44.6	45.6	46.9	48.4	50.3	52.5	55.0	57.8
2800	47.9	48.9	50.3	51.9	53.9	56.3	59.0	61.9
3000	51.2	52.3	53.7	55.4	57.5	60.0	62.9	66.0

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (11%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Intentionally
Blank

Performance Dispatch — Chapter PD
Landing — Section 32

Landing Field Limit Weight - Dry Runway
Flaps 30
Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200				1200	1240	1330	1410	1510
1400		1150	1240	1400	1450	1540	1630	1740
1600	1210	1330	1430	1600	1660	1760	1860	1970
1800	1380	1500	1620	1800	1880	1980	2090	2210
2000	1540	1680	1820	2000	2090	2190	2320	2440
2200	1710	1860	2010	2200	2300	2410	2550	2670
2400	1880	2040	2210	2400	2510	2620	2780	2900
2600	2050	2220	2400	2600	2730	2870	3030	3200
2800	2220	2400	2570	2800	2940	3120	3290	3500
3000	2350	2540	2740	3000	3150	3380	3540	3800
3200	2490	2690	2910	3200	3360	3600	3800	4100
3400	2620	2830	3080	3400	3580	3830	4060	4400
3600	2750	2980	3250	3600	3790	4050	4310	4700
3800	2880	3120	3420	3800	4000	4280	4570	
4000	3020	3260	3590	4000	4210	4500		
4200	3150	3410	3760	4200	4430			
4400	3280	3550	3930	4400				
4600	3410	3690	4100	4600				
4800	3550	3840	4270	4800				
5000	3680	3980	4440					

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1200	144.2				
1400	176.9	166.6	156.6	146.9	
1600	210.2	198.0	186.2	174.9	164.3
1800	234.4	226.1	216.4	203.3	191.0
2000	253.8	244.8	236.0	227.4	218.1
2200	272.4	262.8	253.3	244.1	235.1
2400	290.3	280.1	270.0	260.2	250.7
2600	306.1	296.7	286.2	275.8	265.7
2800	319.4	310.4	301.1	290.8	280.2
3000	328.9	320.1	310.7	300.9	291.4
3200		329.4	319.5	309.2	299.7
3400			327.5	317.0	307.0
3600				324.2	314.0
3800				331.4	320.5
4000					326.9
4200					333.2

With 1 brake deactivated, decrease weight by 16300 kg.
With 2 brakes deactivated, decrease weight by 33200 kg.
With manual speedbrakes, decrease weight by 16700 kg.

Landing Field Limit Weight - Wet Runway

Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200						1340	1410	1530
1400				1400	1440	1550	1640	1760
1600		1310	1410	1600	1660	1770	1870	1990
1800	1350	1490	1610	1800	1870	1980	2100	2220
2000	1520	1670	1800	2000	2080	2200	2320	2450
2200	1690	1850	1990	2200	2290	2410	2550	2690
2400	1860	2030	2190	2400	2510	2630	2780	2920
2600	2030	2200	2380	2600	2720	2840	3010	3150
2800	2200	2380	2580	2800	2930	3060	3240	3400
3000	2370	2560	2770	3000	3140	3310	3500	3690
3200	2540	2740	2940	3200	3360	3570	3750	3990
3400	2670	2890	3110	3400	3570	3820	4010	4290
3600	2800	3030	3280	3600	3780	4050	4270	4600
3800	2940	3180	3450	3800	3990	4280	4520	4900
4000	3070	3320	3620	4000	4210	4500	4780	5200
4200	3200	3460	3790	4200	4420	4720	5040	
4400	3330	3610	3960	4400	4630	4950		
4600	3470	3750	4130	4600	4840			
4800	3600	3900	4300	4800				
5000	3730	4040	4470	5000				

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	147.0				
1600	175.5	165.2	155.3	145.7	
1800	204.4	192.5	181.0	170.0	159.6
2000	228.3	220.2	207.1	194.6	182.8
2200	245.5	236.8	228.2	219.0	206.3
2400	262.0	252.7	243.6	234.7	226.0
2600	277.9	268.1	258.5	249.0	239.9
2800	293.3	283.0	272.9	262.9	253.3
3000	306.7	297.3	286.8	276.4	266.3
3200	318.3	309.3	299.8	289.5	278.9
3400	326.9	318.1	308.7	298.8	289.2
3600		326.1	316.5	306.4	296.9
3800		334.2	323.6	313.3	303.6
4000			330.6	319.9	309.8
4200				326.1	315.7
4400				332.3	321.4
4600					326.9
4800					332.4

With 1 brake deactivated, decrease weight by 16300 kg.
With 2 brakes deactivated, decrease weight by 33200 kg.
With manual speedbrakes, decrease weight by 16700 kg.

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	242.6				
52	126	248.6				
50	122	254.4	235.2			
48	118	260.1	241.0			
46	115	265.7	246.5	226.7		
44	111	271.6	252.0	231.1		
42	108	277.9	257.4	235.4	218.6	
40	104	283.9	262.6	239.8	222.3	
38	100	288.9	267.7	243.9	225.7	208.8
36	97	293.8	272.7	248.1	229.2	212.0
34	93	298.7	276.8	252.2	232.6	215.1
32	90	303.1	280.8	256.0	236.1	218.3
30	86	306.4	284.7	259.8	239.8	221.4
28	82	307.4	288.4	263.5	243.4	224.7
26	79	307.5	291.5	266.9	247.0	228.1
24	75	307.5	292.7	270.0	250.4	231.0
22	72	307.6	292.8	272.5	252.5	232.9
20	68	307.6	292.8	273.5	253.6	234.4
18	64	307.7	292.9	273.6	254.7	236.1
16	61	307.7	292.9	273.6	255.2	237.8
14	57	307.8	293.0	273.7	255.2	239.1
12	54	307.8	293.0	273.7	255.3	239.5
10	50	307.9	293.1	273.7	255.3	239.6
-40	-40	309.3	294.4	275.0	256.4	240.6

With engine bleed for packs off, increase weight by 950 kg.
With engine and wing anti-ice on, decrease weight by 1450 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 20450 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 20, Gear Up

Based on engine bleed for packs on or off, engine anti-ice on or off and wing anti-ice off.

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)											
	PRESSURE ALTITUDE (FT)											
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
54	4.93	4.53	4.13									
50	5.61	5.21	4.80	4.27	3.76							
46	6.31	5.89	5.45	4.93	4.42	3.83	3.32					
42	6.86	6.59	6.15	5.57	5.02	4.36	3.79	3.30	2.84			
38	7.36	7.07	6.74	6.14	5.56	4.86	4.22	3.72	3.23	2.75	2.26	
34	7.81	7.55	7.21	6.61	6.00	5.32	4.66	4.12	3.59	3.10	2.62	2.44
30	7.82	7.80	7.69	7.03	6.42	5.72	5.06	4.50	3.98	3.46	2.96	2.77
26	7.83	7.81	7.70	7.24	6.76	6.07	5.41	4.86	4.32	3.81	3.30	3.07
22	7.83	7.81	7.70	7.24	6.79	6.26	5.70	5.10	4.60	4.04	3.53	3.33
18	7.84	7.82	7.71	7.25	6.80	6.27	5.75	5.24	4.71	4.22	3.70	3.47
14	7.84	7.82	7.71	7.26	6.80	6.27	5.76	5.25	4.75	4.32	3.88	3.68
10	7.85	7.83	7.72	7.26	6.81	6.28	5.76	5.25	4.76	4.32	3.88	3.71

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
320	-4.19	-4.16	-4.39	-4.90	-5.31	-5.73	-6.17	-6.54	-7.00	-7.58
300	-3.44	-3.55	-3.81	-4.23	-4.58	-4.94	-5.31	-5.64	-6.03	-6.51
280	-2.70	-2.93	-3.22	-3.56	-3.85	-4.15	-4.46	-4.74	-5.07	-5.44
260	-1.95	-2.32	-2.64	-2.88	-3.11	-3.35	-3.60	-3.85	-4.11	-4.37
240	-1.52	-1.72	-1.92	-2.09	-2.26	-2.44	-2.62	-2.80	-2.99	-3.18
220	-0.82	-0.95	-1.06	-1.15	-1.25	-1.35	-1.45	-1.55	-1.65	-1.74
200	0	0	0	0	0	0	0	0	0	0
180	1.08	1.18	1.29	1.39	1.51	1.63	1.76	1.90	2.03	2.17
160	2.31	2.62	2.90	3.15	3.42	3.70	3.99	4.30	4.65	5.03
140	3.55	4.06	4.52	4.91	5.33	5.76	6.22	6.70	7.27	7.90

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
VREF	-0.24	-0.25	-0.27	-0.28	-0.29	-0.29	-0.29	-0.29	-0.28	-0.28
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.17	0.17	0.16	0.17	0.18	0.18	0.17	0.16	0.14	0.13
VREF+20	0.32	0.30	0.29	0.30	0.30	0.30	0.29	0.26	0.23	0.21
VREF+30	0.35	0.30	0.25	0.22	0.20	0.18	0.16	0.14	0.11	0.09

With engine and wing anti-ice on, decrease gradient by 0.1%.
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 0.6%.

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	232.8				
50	122	234.4	225.2			
45	113	236.4	227.2	218.4		
40	104	238.4	229.2	220.2	211.9	
35	95	240.6	231.2	222.1	213.7	205.7
30	86	242.7	233.3	224.0	215.5	207.4
25	77	245.0	235.4	226.1	217.3	209.1
20	68	247.3	237.6	228.2	219.2	210.9
15	59	249.6	239.9	230.3	221.1	212.8
10	50	252.1	242.2	232.5	223.2	214.7
5	41	254.6	244.6	234.8	225.4	216.6
0	32	257.1	247.0	237.2	227.6	218.6
-5	23	259.8	249.6	239.6	229.9	220.7
-10	14	262.5	252.2	242.1	232.3	222.9
-15	5	265.3	254.9	244.7	234.8	225.2
-20	-4	268.2	257.6	247.3	237.3	227.7
-30	-22	274.2	263.4	252.9	242.6	232.7
-40	-40	280.5	269.5	258.7	248.2	238.1
-50	-58	287.2	275.9	264.9	254.2	243.8
-54	-65	289.9	278.6	267.5	256.7	246.1

Increase weight by 2200 kg per 1% uphill slope. Decrease weight by 4850 kg per 1% downhill slope. Increase weight by 5900 kg per 10 knots headwind. Decrease weight by 33400 kg per 10 knots tailwind.

Decrease weight by 12700 kg when one brake is deactivated. Decrease weight by 26100 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

Intentionally
Blank

GEAR DOWN

Takeoff Climb Limit Weight

Flaps 15

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54.0	129.0	176.6				
52.0	126.0	181.4				
50.0	122.0	186.1	170.3			
48.0	118.0	190.7	174.7			
46.0	115.0	195.3	178.9	163.3		
44.0	111.0	199.8	183.0	167.3		
42.0	108.0	204.2	187.2	171.2		
40.0	104.0	208.7	191.3	175.0	157.9	
38.0	100.0	213.6	195.3	178.8	161.5	
36.0	97.0	218.4	199.4	182.5	165.2	
34.0	93.0	223.3	204.4	186.2	168.8	
32.0	90.0	228.1	209.3	190.0	172.4	155.7
30.0	86.0	232.9	214.2	195.0	176.0	159.2
28.0	82.0	237.4	219.0	199.9	179.6	162.7
26.0	79.0	242.0	223.7	204.6	184.4	166.2
24.0	75.0	244.2	228.2	209.3	189.0	169.7
22.0	72.0	244.3	232.6	213.8	193.6	174.2
20.0	68.0	244.3	234.7	218.3	197.9	178.6
18.0	64.0	244.3	234.7	222.6	202.3	183.0
16.0	61.0	244.3	234.7	224.5	206.5	187.1
14.0	57.0	244.2	234.7	224.5	210.6	191.2
12.0	54.0	244.2	234.7	224.5	212.3	195.1
10.0	50.0	244.2	234.7	224.4	212.3	199.0
-40.0	-40.0	243.5	234.0	223.3	211.3	199.7

With engine bleeds for packs off, increase weight by 150 kg.
With engine anti-ice on, decrease weight by 3700 kg.
With engine and wing anti-ice on, decrease weight by 4600 kg.

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	209.9				
52	126	215.0				
50	122	220.0	204.2			
48	118	224.8	209.1			
46	115	229.7	213.7	197.1		
44	111	234.7	218.3	200.7		
42	108	240.0	222.6	204.1	189.6	
40	104	245.3	226.8	207.5	192.6	
38	100	249.2	230.9	210.8	195.5	180.8
36	97	253.0	234.7	214.2	198.3	183.5
34	93	256.9	238.1	217.4	201.1	186.2
32	90	260.6	241.4	220.5	204.0	188.8
30	86	264.3	244.6	223.4	206.8	191.3
28	82	264.2	247.5	226.4	209.6	193.9
26	79	264.2	250.4	229.1	212.4	196.6
24	75	264.3	250.9	231.5	215.1	199.2
22	72	264.3	251.0	233.9	216.7	200.5
20	68	264.3	251.0	234.5	217.6	201.6
18	64	264.4	251.1	234.5	218.4	203.0
16	61	264.4	251.1	234.5	218.8	204.6
14	57	264.5	251.1	234.6	218.9	206.1
12	54	264.5	251.2	234.6	218.9	206.1
10	50	264.6	251.2	234.7	218.9	206.2
8	46	264.6	251.3	234.7	219.0	206.2
6	43	264.7	251.3	234.8	219.0	206.2
4	39	264.7	251.3	234.8	219.1	206.3
2	36	264.8	251.4	234.8	219.1	206.3
0	32	264.8	251.4	234.9	219.1	206.4

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight by 800 kg.
With engine and wing anti-ice on, decrease weight by 1100 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26400 kg.

GEAR DOWN

Takeoff Obstacle Limit Weight
Flaps 15
Sea Level, 30°C & Below, Zero Wind

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	238.6										
20	222.1	238.6	238.6								
40	206.0	221.9	234.5	238.6							
60	193.3	209.2	221.7	231.9	238.6						
80	183.0	198.5	211.2	221.5	230.1	238.6	238.6				
100	174.1	189.4	202.0	212.6	221.3	228.8	235.1	238.6	238.6		
120	166.4	181.4	194.0	204.6	213.6	221.1	227.7	233.4	237.9	238.6	
140	159.2	174.3	186.8	197.4	206.5	214.3	220.9	226.8	232.0	236.5	238.6
160		167.9	180.3	190.9	200.0	207.9	214.8	220.7	226.0	230.8	235.0
180		162.1	174.4	184.9	194.1	202.0	209.0	215.1	220.5	225.3	229.7
200		156.8	168.9	179.4	188.6	196.6	203.6	209.9	215.4	220.3	224.7
220			163.9	174.3	183.5	191.5	198.6	204.9	210.6	215.6	220.1
240			159.2	169.6	178.7	186.7	193.9	200.3	206.0	211.1	215.8
260				165.1	174.2	182.3	189.4	195.9	201.7	206.9	211.6
280				160.9	170.0	178.0	185.2	191.7	197.5	202.8	207.6
300				157.0	166.0	174.0	181.3	187.7	193.6	198.9	203.8

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)					
	140	160	180	200	220	240
29 & BELOW	0	0	0	0	0	0
30	-0.5	-0.9	-1.3	-1.7	-2.1	-2.5
32	-1.4	-2.6	-3.8	-5.0	-6.3	-7.5
34	-2.3	-4.3	-6.4	-8.4	-10.5	-12.5
36	-3.2	-6.0	-8.9	-11.8	-14.6	-17.5
38	-4.1	-7.8	-11.5	-15.1	-18.8	-22.5
40	-5.0	-9.5	-14.0	-18.5	-23.0	-27.5
42	-6.0	-11.3	-16.6	-21.9	-27.2	-32.4
44	-7.1	-13.2	-19.2	-25.3	-31.3	-37.4
46	-8.1	-15.0	-21.8	-28.6	-35.5	-42.3
48	-9.2	-16.8	-24.4	-32.0	-39.6	-47.2
50	-10.2	-18.6	-27.0	-35.4	-43.8	-52.2

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	140	160	180	200	220	240
S.L. & BELOW	0	0	0	0	0	0
1000	-4.4	-5.5	-6.6	-7.7	-8.8	-9.9
2000	-8.8	-11.0	-13.2	-15.4	-17.6	-19.8
3000	-13.1	-16.5	-19.9	-23.3	-26.7	-30.1
4000	-17.4	-22.0	-26.6	-31.2	-35.8	-40.4
5000	-21.7	-27.5	-33.3	-39.1	-44.9	-50.7
6000	-26.0	-33.0	-40.0	-47.0	-54.0	-61.0
7000	-30.3	-38.5	-46.7	-54.9	-63.1	-71.3
8000	-34.6	-44.0	-53.4	-62.8	-72.2	-81.6

GEAR DOWN

Takeoff Obstacle Limit Weight
Flaps 15
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	140	160	180	200	220	240
15 TW	-27.2	-26.1	-24.9	-23.7	-22.6	-21.4
10 TW	-18.2	-17.4	-16.6	-15.8	-15.0	-14.2
5 TW	-9.1	-8.7	-8.3	-7.9	-7.5	-7.1
0	0	0	0	0	0	0
10 HW	4.2	3.8	3.3	2.9	2.4	2.0
20 HW	8.4	7.5	6.6	5.7	4.9	4.0
30 HW	11.9	10.7	9.6	8.4	7.2	6.1
40 HW	15.4	13.9	12.5	11.1	9.6	8.2

With engine bleed for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 1100 kg.
With engine and wing anti-ice on, decrease weight by 1700 kg.

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	12900	10300	6800
290	14400	11900	8900
280	16000	13500	10800
270	17600	15100	12500
260	19200	16800	14300
250	20700	18500	16100
240	22100	20200	17900
230	23500	21700	19700
220	25000	23200	21300
210	25900	24800	22900
200	26900	25800	24500
190	28000	26800	25700
180	29000	27900	26800
170	30200	29000	27800
160	31500	30200	29000

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
332	295	263	238	218	200	188	176	166	157	149
499	443	395	357	327	300	281	264	248	235	223
665	591	527	477	436	400	374	352	331	313	298
830	737	658	596	545	500	469	440	415	392	373
994	884	789	714	653	600	563	529	498	471	448
1158	1030	920	833	762	700	656	617	581	550	523
1320	1175	1051	952	871	800	750	705	664	629	598
1481	1320	1181	1070	979	900	844	793	748	708	674
1642	1464	1310	1188	1088	1000	938	882	832	787	749
1802	1607	1439	1305	1196	1100	1032	970	915	867	824
1961	1750	1568	1423	1304	1200	1126	1059	999	946	900
2119	1892	1696	1540	1412	1300	1220	1148	1083	1026	976
2277	2034	1825	1658	1520	1400	1314	1237	1167	1106	1052
2434	2175	1953	1775	1628	1500	1409	1326	1251	1185	1128
2590	2316	2081	1892	1736	1600	1503	1415	1336	1265	1204
2745	2457	2208	2009	1844	1700	1597	1504	1420	1345	1280
2900	2597	2336	2126	1952	1800	1691	1593	1504	1425	1356
3054	2737	2463	2242	2060	1900	1786	1682	1588	1505	1433
3207	2876	2589	2359	2168	2000	1880	1770	1672	1585	1509

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		10		14		18		22	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	8.5	0:52	8.1	0:50	7.7	0:48	7.5	0:47	7.3	0:45
300	12.6	1:16	12.0	1:13	11.3	1:10	10.9	1:07	10.6	1:05
400	16.7	1:40	15.9	1:35	14.9	1:31	14.3	1:27	13.8	1:24
500	20.9	2:03	19.8	1:58	18.6	1:53	17.8	1:48	17.2	1:43
600	25.1	2:27	23.8	2:20	22.2	2:14	21.3	2:08	20.5	2:02
700	29.4	2:50	27.8	2:42	26.0	2:35	24.8	2:28	23.9	2:21
800	33.7	3:13	31.8	3:04	29.7	2:56	28.4	2:48	27.2	2:40
900	38.0	3:36	36.0	3:26	33.5	3:16	32.0	3:07	30.7	2:59
1000	42.4	3:59	40.1	3:48	37.4	3:37	35.7	3:27	34.2	3:18
1100	46.9	4:22	44.3	4:09	41.3	3:57	39.4	3:47	37.7	3:36
1200	51.4	4:44	48.5	4:31	45.2	4:18	43.1	4:06	41.3	3:54
1300	56.0	5:06	52.8	4:51	49.2	4:38	47.0	4:25		
1400	60.6	5:28	57.1	5:12	53.3	4:58	50.8	4:44		
1500	65.2	5:50	61.4	5:33	57.3	5:18				
1600	69.8	6:12	65.8	5:54	61.4	5:38				
1700	74.6	6:33	70.3	6:15	65.6	5:57				
1800	79.4	6:54	74.8	6:35	69.8	6:17				
1900	84.2	7:15	79.3	6:55	74.1	6:36				
2000	88.9	7:37	83.8	7:16	78.3	6:56				

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
10	-1.1	-0.6	0.0	0.7	1.4
15	-1.7	-0.8	0.0	1.1	2.1
20	-2.2	-1.1	0.0	1.4	2.8
25	-2.8	-1.4	0.0	1.7	3.4
30	-3.3	-1.7	0.0	2.0	4.1
35	-3.8	-1.9	0.0	2.4	4.7
40	-4.4	-2.2	0.0	2.7	5.4
45	-4.9	-2.5	0.0	3.0	6.1
50	-5.4	-2.7	0.0	3.4	6.7
55	-6.0	-3.0	0.0	3.7	7.4
60	-6.5	-3.2	0.0	4.0	8.0
65	-7.0	-3.5	0.0	4.4	8.7
70	-7.5	-3.7	0.0	4.7	9.3
75	-8.1	-4.0	0.0	5.1	10.0
80	-8.6	-4.2	0.0	5.4	10.6
85	-9.1	-4.5	0.0	5.7	11.3
90	-9.6	-4.7	0.0	6.1	11.9

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
101	84	72	63	56	50	45	42	38	36	33
173	151	134	120	109	100	92	86	80	75	70
245	218	196	178	163	150	139	130	122	114	108
317	284	257	235	216	200	186	174	164	154	146
388	350	318	292	269	250	233	219	206	195	184
460	415	379	348	322	300	281	263	248	235	223
531	481	440	405	376	350	328	308	291	275	261
602	547	501	462	429	400	375	353	333	315	299
674	613	562	519	482	450	422	397	375	355	338
747	680	624	576	535	500	469	442	417	395	376

Trip Fuel and Time

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.9	2.1	2.2	2.4	2.6	0:15
	ALT (FT)	12000	12000	12000	10000	10000	
100	FUEL (1000 KG)	3.3	3.5	3.8	4.1	4.4	0:25
	ALT (FT)	24000	21000	20000	18000	16000	
150	FUEL (1000 KG)	4.4	4.9	5.3	5.7	6.2	0:35
	ALT (FT)	30000	31000	25000	22000	22000	
200	FUEL (1000 KG)	5.6	6.1	6.7	7.3	7.9	0:45
	ALT (FT)	30000	31000	28000	24000	24000	
250	FUEL (1000 KG)	6.7	7.4	8.1	8.8	9.6	0:54
	ALT (FT)	30000	31000	29000	24000	25000	
300	FUEL (1000 KG)	7.8	8.7	9.5	10.4	11.3	1:03
	ALT (FT)	30000	31000	29000	24000	25000	
350	FUEL (1000 KG)	9.0	10.0	10.9	11.9	13.0	1:12
	ALT (FT)	30000	31000	29000	24000	25000	
400	FUEL (1000 KG)	10.1	11.2	12.3	13.5	14.7	1:21
	ALT (FT)	30000	31000	28000	24000	24000	
450	FUEL (1000 KG)	11.3	12.5	13.8	15.1	16.4	1:30
	ALT (FT)	30000	30000	28000	24000	24000	
500	FUEL (1000 KG)	12.5	13.8	15.2	16.7	18.2	1:40
	ALT (FT)	30000	30000	28000	24000	24000	

GEAR DOWN

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
300	14110	14080	14220	14510			
280	13150	13130	13210	13380			
260	12300	12260	12320	12400	12730		
240	11490	11430	11480	11430	11700		
220	10680	10600	10640	10520	10730	11030	
200	9860	9780	9790	9660	9790	10000	
180	9280	8950	8930	8820	8810	9000	
160	8460	8340	8090	7980	7930	8080	8230

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	13550	13540	13660	13840	
280	12580	12570	12650	12740	
260	11710	11680	11750	11790	12050
240	10880	10820	10890	10820	11020
220	10030	9960	10000	9900	10050
200	9440	9120	9120	9030	9080
180	8590	8490	8260	8160	8150
160	7740	7660	7410	7420	7400

These tables include 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
17	155.0		
16	161.1		
15	166.6	158.8	
14	172.3	164.4	155.7
13	178.1	170.1	161.2
12	184.0	175.9	166.9
11	189.8	181.2	172.0
10	195.6	186.8	177.3
9	201.0	191.8	182.1
8	206.3	196.9	187.0
7	211.6	202.1	191.9
6	217.0	207.2	196.8
5	222.5	212.5	201.8
4	226.9	216.7	206.0
3	231.2	220.8	210.0
2	235.3	224.9	214.1

Based on max continuous thrust limits with anti-ice off.
With engine anti-ice on, decrease level off weight by 3400 kg.
With engine and wing anti-ice on, decrease level off weight by 4500 kg.

Intentionally
Blank

Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire, Brake Energy and Obstacle Limit Weights as determined from the following tables.

Field Limit Weight - Slope and Wind Corrections

These tables provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction table with slope corrected field length and wind component to determine the slope and wind corrected field length.

Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude with “Slope and Wind Corrected Field Length” determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

Tire Speed Limit

Maximum tire speed limited weights are presented for 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Brake Energy Limits VMBE

Tables are presented to determine the Maximum Brake Energy Speed VMBE. Compliance with this limitation is required to ensure that the brakes have enough capacity to execute a maximum effort stop from V1 without the use of thrust reversers. Enter the upper table with pressure altitude and OAT to determine the reference VMBE. Then enter the lower table with the reference VMBE and brake release weight to determine VMBE for a specific takeoff. Adjust for slope, wind and deactivated brakes as described below the table. The resulting VMBE must be greater than or equal to V1. If VMBE is less than V1, brake release weight must be decreased by the amount shown below the table.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field and brake energy limit weights and the V1 and VMBE must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3500 kg and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 7200 kg and the V1 associated with the reduced weight by three knots. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance corrected for wind and slope exceeds approximately 1200 m for one brake deactivated or 1300 m for two brakes deactivated.

For brake(s) deactivated, reduce VMBE by the amount shown on the Brake Energy Limit VMBE Chart. If the resulting VMBE is less than V1, the brake release weight must be reduced according to the instructions on the brake energy limit chart. The resulting V1 must not be less than V1(MCG). Determine VR and V2 for the actual weight.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability at two center of gravity positions: 7.5% MAC (FMC default) for use when no center of gravity is entered on the PERF INIT page, and 30% MAC (typical mid cruise center of gravity) for use when 30% MAC is entered. Crews may interpolate between these values to determine the airplane's capability at other specific center of gravity positions. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time Table with air distance from the Ground to Air Miles Conversion Table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter

the Fuel Required Adjustment Table with the Reference Fuel and the planned landing weight to obtain fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system) or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 30.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

Gear Down

This section provides flight planning data for revenue operation with gear down.

Takeoff/Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to determine Takeoff Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

Performance Dispatch — Chapter PD

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777-300ER GE90-115BL KG FAA

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1230	1220	1210	1210	1200	1190	1180	1170	1160
1400	1450	1430	1420	1410	1400	1380	1360	1350	1330
1600	1670	1650	1630	1620	1600	1580	1550	1530	1500
1800	1880	1860	1840	1820	1800	1770	1740	1710	1670
2000	2100	2080	2050	2030	2000	1960	1920	1890	1850
2200	2320	2290	2260	2230	2200	2150	2110	2060	2020
2400	2540	2510	2470	2440	2400	2350	2300	2240	2190
2600	2760	2720	2680	2640	2600	2540	2480	2420	2370
2800	2980	2940	2890	2850	2800	2730	2670	2600	2540
3000	3200	3150	3100	3050	3000	2930	2860	2780	2710
3200	3420	3370	3310	3260	3200	3120	3040	2960	2880
3400	3640	3580	3520	3460	3400	3310	3230	3140	3060
3600	3860	3800	3730	3670	3600	3510	3410	3320	3230
3800	4080	4010	3940	3870	3800	3700	3600	3500	3400
4000	4300	4220	4150	4070	4000	3890	3790	3680	3580
4200	4520	4440	4360	4280	4200	4090	3970	3860	3750
4400	4740	4650	4570	4480	4400	4280	4160	4040	3920
4600	4960	4870	4780	4690	4600	4470	4350	4220	4090
4800	5180	5080	4990	4890	4800	4670	4530	4400	4270
5000	5400	5300	5200	5100	5000	4860	4720	4580	4440

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	900	1000	1100	1200	1270	1350	1430	1510
1400	1070	1180	1290	1400	1480	1560	1650	1730
1600	1230	1360	1480	1600	1690	1770	1860	1960
1800	1400	1530	1670	1800	1890	1990	2080	2180
2000	1570	1710	1860	2000	2100	2200	2300	2410
2200	1730	1890	2040	2200	2300	2410	2520	2630
2400	1900	2070	2230	2400	2510	2620	2740	2860
2600	2070	2240	2420	2600	2720	2830	2960	3080
2800	2230	2420	2610	2800	2920	3050	3180	3310
3000	2400	2600	2800	3000	3130	3260	3390	3530
3200	2570	2780	2990	3200	3330	3470	3610	3760
3400	2730	2960	3180	3400	3540	3680	3830	3980
3600	2900	3130	3370	3600	3750	3900	4050	4200
3800	3070	3310	3560	3800	3950	4110	4270	4430
4000	3230	3490	3740	4000	4160	4320	4490	4650
4200	3400	3670	3930	4200	4370	4530	4700	4880
4400	3570	3840	4120	4400	4570	4750	4920	5100
4600	3730	4020	4310	4600	4780	4960	5140	5330
4800	3900	4200	4500	4800	4980	5170	5360	5550
5000	4070	4380	4690	5000	5190	5380	5580	5780

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1400	248.9	224.7	223.2	221.7	220.3	218.9	214.5	209.1	203.1	197.0	190.8
1600	268.1	242.3	240.7	239.1	237.6	236.1	231.3	225.6	219.2	212.7	206.1
1800	286.1	258.7	257.0	255.4	253.7	252.1	247.1	241.0	234.3	227.4	220.4
2000	302.9	274.2	272.4	270.6	268.9	267.2	261.9	255.5	248.5	241.2	233.9
2200	318.5	288.6	286.7	284.9	283.1	281.3	275.8	269.2	261.8	254.2	246.6
2400	333.1	302.1	300.2	298.3	296.4	294.6	288.9	282.0	274.4	266.5	258.6
2600	346.0	314.0	311.9	310.0	308.1	306.2	300.3	293.2	285.3	277.2	269.0
2800	360.3	327.3	325.2	323.2	321.2	319.3	313.2	305.9	297.8	289.4	280.9
3000	371.7	337.7	335.5	333.5	331.4	329.4	323.2	315.6	307.3	298.6	289.9
3200	378.7	347.7	345.5	343.3	341.3	339.2	332.8	325.0	316.4	307.5	298.6
3400	378.7	357.2	355.0	352.8	350.7	348.6	342.0	334.0	325.2	316.0	306.9
3600	378.7	366.4	364.1	361.9	359.7	357.5	350.8	342.6	333.6	324.2	314.9
3800	378.7	375.1	372.7	370.4	368.2	366.0	359.1	350.7	341.6	332.0	322.5
4000	378.7	378.7	378.7	378.6	376.3	374.1	367.1	358.6	349.2	339.5	329.8
4200	378.7	378.7	378.7	378.7	378.7	378.7	374.8	366.2	356.6	346.7	336.8
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.5	363.8	353.7	343.7
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	370.7	360.5	350.3
CLIMB LIMIT WT (1000 KG)	373.4	373.4	373.3	373.1	372.9	372.8	360.3	346.1	330.6	315.5	300.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1400	232.8	210.9	209.5	208.1	206.8	202.9	198.7	193.6	188.0	181.5	175.1
1600	250.9	227.5	226.0	224.5	223.1	219.0	214.5	209.0	203.1	196.1	189.3
1800	267.9	243.1	241.5	239.9	238.4	234.1	229.3	223.5	217.2	209.8	202.6
2000	283.7	257.7	256.0	254.4	252.8	248.3	243.2	237.1	230.5	222.7	215.1
2200	298.6	271.4	269.7	268.0	266.3	261.6	256.4	250.0	243.1	235.0	227.1
2400	312.5	284.3	282.5	280.8	279.0	274.1	268.7	262.1	255.0	246.6	238.4
2600	324.7	295.6	293.7	291.9	290.1	285.1	279.5	272.6	265.2	256.5	248.1
2800	338.3	308.3	306.4	304.5	302.7	297.5	291.7	284.7	277.1	268.1	259.4
3000	349.0	318.2	316.2	314.2	312.4	307.0	301.0	293.8	285.9	276.7	267.7
3200	359.3	327.6	325.6	323.6	321.6	316.1	310.0	302.5	294.5	285.0	275.8
3400	369.2	336.7	334.6	332.5	330.6	324.9	318.6	311.0	302.7	293.0	283.5
3600	378.7	345.4	343.2	341.1	339.1	333.3	326.9	319.0	310.6	300.6	290.9
3800	378.7	353.6	351.4	349.2	347.2	341.3	334.7	326.7	318.1	307.9	298.0
4000	378.7	361.4	359.2	357.1	354.9	348.9	342.2	334.1	325.3	314.9	304.8
4200	378.7	369.1	366.8	364.6	362.5	356.3	349.5	341.2	332.3	321.7	311.5
4400	378.7	376.4	374.1	371.9	369.7	363.5	356.6	348.1	339.0	328.3	317.9
4600	378.7	378.7	378.7	378.7	376.7	370.4	363.4	354.8	345.5	334.7	324.1
CLIMB LIMIT WT (1000 KG)	353.4	353.3	353.2	353.0	352.9	343.3	332.8	319.6	305.5	290.3	276.8

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1750 kg.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 15

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1400	217.2	196.9	195.6	194.3	191.4	187.7	183.2	178.3	172.5	166.4	161.1
1600	234.3	212.6	211.2	209.8	206.7	202.7	198.0	192.7	186.5	180.0	174.3
1800	250.2	227.3	225.8	224.3	221.0	216.8	211.8	206.2	199.7	192.8	186.7
2000	265.2	241.1	239.5	238.0	234.6	230.1	224.8	219.0	212.1	204.9	198.5
2200	279.2	254.1	252.5	250.9	247.3	242.7	237.2	231.1	223.9	216.4	209.7
2400	292.4	266.4	264.7	263.1	259.3	254.5	248.8	242.5	235.1	227.3	220.4
2600	304.0	277.1	275.3	273.6	269.8	264.8	258.9	252.4	244.7	236.6	229.5
2800	317.0	289.3	287.5	285.7	281.7	276.6	270.5	263.8	255.9	247.6	240.2
3000	327.1	298.5	296.7	294.8	290.7	285.5	279.2	272.3	264.1	255.6	248.0
3200	336.7	307.4	305.5	303.6	299.4	294.0	287.6	280.5	272.0	263.3	255.5
3400	346.0	315.9	314.0	312.1	307.8	302.2	295.6	288.3	279.7	270.7	262.7
3600	354.9	324.1	322.1	320.2	315.8	310.1	303.3	295.9	287.0	277.8	269.6
3800	363.4	331.9	329.9	327.9	323.4	317.5	310.7	303.0	294.0	284.6	276.3
4000	371.4	339.4	337.3	335.3	330.7	324.7	317.8	310.0	300.8	291.2	282.7
4200	378.7	346.6	344.5	342.4	337.8	331.7	324.6	316.7	307.3	297.6	288.9
4400	378.7	353.6	351.5	349.3	344.6	338.5	331.2	323.2	313.7	303.8	295.0
4600	378.7	360.4	358.2	356.0	351.2	345.0	337.6	329.4	319.8	309.7	300.8
CLIMB LIMIT WT (1000 KG)	329.7	329.6	329.5	329.3	323.9	315.8	305.3	294.2	280.8	267.3	256.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1400	202.1	183.0	181.6	179.2	175.5	171.0	167.1	162.8	157.6	152.6	147.7
1600	218.1	197.7	196.3	193.6	189.7	184.9	180.7	176.1	170.6	165.3	160.1
1800	233.1	211.5	210.0	207.2	203.0	198.0	193.5	188.6	182.8	177.2	171.6
2000	247.2	224.5	222.9	220.0	215.6	210.3	205.6	200.5	194.4	188.5	182.7
2200	260.5	236.9	235.2	232.1	227.6	222.1	217.2	211.8	205.4	199.3	193.2
2400	273.0	248.5	246.8	243.6	238.9	233.2	228.1	222.6	215.9	209.5	203.3
2600	283.9	258.6	256.8	253.5	248.7	242.7	237.5	231.8	224.9	218.3	211.8
2800	296.3	270.2	268.4	265.0	260.0	253.9	248.4	242.5	235.5	228.7	222.0
3000	305.8	278.9	277.0	273.5	268.3	262.1	256.5	250.4	243.2	236.1	229.3
3200	314.8	287.2	285.3	281.7	276.4	269.9	264.2	257.9	250.5	243.3	236.2
3400	323.6	295.2	293.3	289.5	284.1	277.5	271.6	265.2	257.6	250.2	242.9
3600	332.0	302.9	300.9	297.1	291.6	284.8	278.8	272.2	264.4	256.8	249.4
3800	339.9	310.3	308.2	304.3	298.7	291.8	285.6	278.9	270.9	263.2	255.6
4000	347.5	317.3	315.2	311.3	305.5	298.5	292.2	285.4	277.2	269.4	261.7
4200	354.9	324.2	322.0	318.0	312.2	305.0	298.6	291.7	283.4	275.4	267.5
4400	362.0	330.8	328.6	324.5	318.6	311.3	304.8	297.7	289.3	281.2	273.2
4600	368.9	337.2	335.0	330.8	324.8	317.4	310.8	303.6	295.1	286.8	278.7
CLIMB LIMIT WT (1000 KG)	306.1	306.1	306.0	302.6	295.5	286.3	278.0	268.7	257.3	246.3	236.2

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1750 kg.

Takeoff Field & Climb Limit Weights - Dry Runway
Flaps 15
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1400	185.6	167.6	165.3	162.1	158.1	154.4	150.5	146.0	141.4	136.8	132.2
1600	200.5	181.2	178.8	175.4	171.1	167.1	163.0	158.2	153.3	148.4	143.5
1800	214.5	194.1	191.5	187.8	183.3	179.1	174.7	169.7	164.4	159.3	154.1
2000	227.7	206.2	203.5	199.7	194.9	190.5	185.9	180.6	175.1	169.7	164.2
2200	240.1	217.8	215.0	211.0	206.0	201.4	196.6	191.1	185.3	179.7	174.0
2400	251.9	228.7	225.8	221.7	216.5	211.8	206.8	201.0	195.1	189.2	183.3
2600	262.1	238.1	235.1	230.8	225.5	220.6	215.5	209.5	203.4	197.3	191.2
2800	273.8	249.1	246.0	241.6	236.1	231.0	225.7	219.6	213.3	207.1	200.8
3000	282.6	257.2	254.0	249.4	243.8	238.6	233.1	226.8	220.3	213.9	207.4
3200	291.0	264.9	261.6	256.9	251.1	245.8	240.2	233.7	227.0	220.4	213.7
3400	299.1	272.3	269.0	264.2	258.2	252.7	247.0	240.3	233.5	226.7	219.8
3600	306.9	279.5	276.1	271.2	265.1	259.4	253.5	246.7	239.7	232.8	225.8
3800	314.4	286.3	282.9	277.8	271.6	265.9	259.9	252.9	245.7	238.7	231.5
4000	321.5	293.0	289.4	284.3	278.0	272.1	266.0	258.9	251.6	244.4	237.1
4200	328.4	299.4	295.8	290.5	284.1	278.1	271.9	264.7	257.3	249.9	242.5
4400	335.1	305.6	301.9	296.6	290.0	284.0	277.6	270.3	262.8	255.3	247.8
4600	341.6	311.6	307.8	302.4	295.8	289.6	283.2	275.8	268.1	260.5	252.9
CLIMB LIMIT WT (1000 KG)	281.5	281.4	278.2	272.0	263.9	256.4	248.2	238.8	228.6	219.0	209.4

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 950 kg and climb limit weight by 1750 kg.

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1220	1210	1210	1200	1200	1190	1180	1170	1150
1400	1440	1430	1420	1410	1400	1380	1360	1350	1330
1600	1660	1650	1630	1620	1600	1580	1550	1530	1500
1800	1890	1860	1840	1820	1800	1770	1740	1710	1680
2000	2110	2080	2050	2030	2000	1960	1920	1890	1850
2200	2330	2300	2260	2230	2200	2160	2110	2070	2020
2400	2550	2510	2480	2440	2400	2350	2300	2250	2200
2600	2770	2730	2690	2640	2600	2540	2480	2430	2370
2800	3000	2950	2900	2850	2800	2740	2670	2610	2540
3000	3220	3160	3110	3050	3000	2930	2860	2790	2720
3200	3440	3380	3320	3260	3200	3120	3050	2970	2890
3400	3660	3600	3530	3470	3400	3320	3230	3150	3060
3600	3880	3810	3740	3670	3600	3510	3420	3330	3240
3800	4110	4030	3950	3880	3800	3700	3610	3510	3410
4000	4330	4250	4160	4080	4000	3900	3790	3690	3580
4200	4550	4460	4370	4290	4200	4090	3980	3870	3760
4400	4770	4680	4590	4490	4400	4280	4170	4050	3930
4600	4990	4890	4800	4700	4600	4480	4350	4230	4110
4800	5220	5110	5010	4900	4800	4670	4540	4410	4280
5000	5440	5330	5220	5110	5000	4860	4730	4590	4450

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	860	970	1090	1200	1280	1360	1450	1540
1400	1030	1150	1280	1400	1480	1570	1670	1770
1600	1200	1330	1470	1600	1690	1790	1890	2000
1800	1360	1510	1650	1800	1900	2000	2110	2230
2000	1530	1690	1840	2000	2100	2210	2330	2460
2200	1700	1870	2030	2200	2310	2430	2550	2690
2400	1870	2050	2220	2400	2510	2640	2770	2920
2600	2040	2220	2410	2600	2720	2850	2990	3150
2800	2200	2400	2600	2800	2930	3060	3210	3380
3000	2370	2580	2790	3000	3130	3280	3430	3610
3200	2540	2760	2980	3200	3340	3490	3660	3840
3400	2710	2940	3170	3400	3540	3700	3880	4070
3600	2870	3120	3360	3600	3750	3920	4100	4300
3800	3040	3290	3550	3800	3960	4130	4320	4530
4000	3210	3470	3740	4000	4160	4340	4540	4760
4200	3380	3650	3930	4200	4370	4550	4760	4990
4400	3540	3830	4110	4400	4570	4770	4980	5220
4600	3710	4010	4300	4600	4780	4980	5200	5450
4800	3880	4190	4490	4800	4990	5190	5420	5680
5000	4050	4360	4680	5000	5190	5410	5640	5910

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 15

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1800	284.0	255.6	253.9	252.1	250.5	248.8	243.6	237.3	230.3	223.2	216.2
2000	300.4	270.4	268.5	266.7	264.9	263.2	257.6	250.9	243.6	236.0	228.5
2200	315.7	284.1	282.1	280.2	278.4	276.5	270.7	263.6	255.9	247.9	240.1
2400	330.2	297.1	295.0	293.0	291.0	289.1	283.0	275.6	267.5	259.2	251.0
2600	343.5	308.9	306.8	304.7	302.6	300.6	294.3	286.6	278.1	269.4	260.8
2800	359.0	323.0	320.8	318.6	316.5	314.4	307.8	299.8	290.9	281.9	273.0
3000	371.0	333.7	331.4	329.1	326.9	324.7	317.9	309.5	300.4	291.0	281.8
3200	378.7	344.6	342.2	339.9	337.6	335.4	328.2	319.6	310.1	300.4	290.8
3400	378.7	355.3	352.8	350.4	348.0	345.7	338.4	329.4	319.6	309.6	299.7
3600	378.7	365.5	363.0	360.5	358.1	355.7	348.1	338.9	328.8	318.5	308.2
3800	378.7	375.3	372.7	370.1	367.6	365.2	357.4	347.9	337.6	326.9	316.4
4000	378.7	378.7	378.7	378.7	376.9	374.3	366.4	356.7	346.0	335.1	324.3
4200	378.7	378.7	378.7	378.7	378.7	378.7	375.1	365.1	354.2	343.1	332.0
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.4	362.2	350.8	339.5
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	370.0	358.3	346.7
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.5	365.5	353.7
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.6	360.5
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.0
CLIMB LIMIT WT (1000 KG)	373.4	373.4	373.3	373.1	372.9	372.8	360.3	346.1	330.6	315.5	300.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1800	264.7	239.3	237.7	236.1	234.5	230.1	225.1	219.2	212.8	205.9	199.4
2000	280.0	253.1	251.3	249.6	248.0	243.3	238.0	231.7	224.9	217.6	210.8
2200	294.3	265.9	264.0	262.3	260.5	255.6	250.1	243.4	236.3	228.6	221.4
2400	307.7	278.0	276.1	274.2	272.4	267.2	261.4	254.4	247.0	238.9	231.4
2600	320.1	289.0	287.0	285.1	283.2	277.7	271.7	264.4	256.7	248.2	240.4
2800	334.6	302.3	300.2	298.2	296.2	290.6	284.3	276.8	268.7	259.9	251.7
3000	345.7	312.2	310.0	307.9	305.9	300.0	293.5	285.7	277.3	268.2	259.7
3200	357.1	322.3	320.1	317.9	315.8	309.7	303.0	294.9	286.2	276.7	268.0
3400	368.1	332.3	330.0	327.7	325.5	319.2	312.3	303.9	294.9	285.1	276.1
3600	378.7	341.8	339.4	337.1	334.9	328.4	321.2	312.6	303.3	293.3	283.9
3800	378.7	350.9	348.5	346.1	343.8	337.1	329.8	320.9	311.3	301.0	291.4
4000	378.7	359.7	357.2	354.8	352.4	345.6	338.0	328.9	319.1	308.5	298.7
4200	378.7	368.3	365.7	363.2	360.8	353.8	346.1	336.7	326.7	315.8	305.7
4400	378.7	376.6	374.0	371.4	368.9	361.8	353.8	344.3	334.0	322.9	312.6
4600	378.7	378.7	378.7	378.7	376.8	369.5	361.4	351.6	341.1	329.8	319.2
4800	378.7	378.7	378.7	378.7	378.7	377.0	368.7	358.7	348.0	336.4	325.6
5000	378.7	378.7	378.7	378.7	378.7	378.7	375.8	365.6	354.7	342.8	331.8
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.2	361.1	349.1	337.8
CLIMB LIMIT WT (1000 KG)	353.4	353.3	353.2	353.0	352.9	343.3	332.8	319.6	305.5	290.3	276.8

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 1100 kg and climb limit weight by 1750 kg.

Takeoff Field & Climb Limit Weights - Wet Runway
Flaps 15
4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1800	246.5	222.9	221.4	219.9	216.6	212.3	207.4	202.3	196.4	190.2	184.8
2000	260.7	235.7	234.1	232.5	229.0	224.4	219.2	213.9	207.6	201.0	195.2
2200	273.9	247.6	245.9	244.3	240.5	235.7	230.2	224.6	218.0	211.1	205.0
2400	286.4	258.9	257.1	255.3	251.4	246.4	240.7	234.8	227.8	220.6	214.2
2600	297.8	269.1	267.2	265.4	261.3	256.0	250.1	243.9	236.7	229.1	222.5
2800	311.4	281.6	279.7	277.7	273.5	268.0	261.8	255.4	247.9	240.0	233.1
3000	321.7	290.7	288.7	286.7	282.3	276.6	270.2	263.5	255.7	247.6	240.4
3200	332.2	300.0	298.0	295.9	291.4	285.5	278.8	271.9	263.8	255.4	248.0
3400	342.4	309.2	307.1	305.0	300.3	294.2	287.3	280.1	271.8	263.1	255.4
3600	352.3	318.1	315.9	313.7	308.8	302.6	295.4	288.1	279.5	270.5	262.6
3800	361.7	326.5	324.3	322.0	317.0	310.6	303.3	295.7	286.9	277.6	269.5
4000	370.8	334.7	332.4	330.1	325.0	318.4	310.8	303.1	294.0	284.5	276.2
4200	378.7	342.6	340.3	337.9	332.7	325.9	318.2	310.3	301.0	291.3	282.7
4400	378.7	350.3	347.9	345.5	340.2	333.2	325.3	317.2	307.7	297.8	289.0
4600	378.7	357.8	355.4	352.9	347.4	340.3	332.3	324.0	314.2	304.1	295.1
4800	378.7	365.1	362.5	360.0	354.4	347.2	338.9	330.5	320.5	310.1	301.0
5000	378.7	372.1	369.5	366.9	361.2	353.8	345.4	336.8	326.6	316.0	306.7
5200	378.7	378.7	376.2	373.6	367.8	360.2	351.7	342.9	332.5	321.7	312.2
CLIMB LIMIT WT (1000 KG)	329.7	329.6	329.5	329.3	323.9	315.8	305.3	294.2	280.8	267.3	256.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1800	228.9	207.0	205.6	203.0	199.2	194.6	190.5	186.1	180.9	175.8	170.8
2000	242.0	218.8	217.3	214.5	210.6	205.7	201.4	196.7	191.1	185.7	180.5
2200	254.2	229.8	228.2	225.3	221.1	216.0	211.4	206.5	200.7	195.0	189.4
2400	265.8	240.2	238.6	235.5	231.1	225.8	221.0	215.8	209.7	203.7	197.9
2600	276.3	249.6	247.9	244.7	240.1	234.5	229.5	224.2	217.7	211.5	205.5
2800	289.1	261.3	259.5	256.2	251.5	245.7	240.4	234.9	228.2	221.7	215.4
3000	298.5	269.7	267.8	264.4	259.4	253.4	248.0	242.2	235.3	228.5	222.0
3200	308.1	278.3	276.3	272.8	267.7	261.4	255.8	249.8	242.7	235.7	228.9
3400	317.6	286.7	284.7	281.1	275.8	269.3	263.5	257.3	249.9	242.7	235.7
3600	326.7	294.9	292.8	289.0	283.6	276.9	271.0	264.6	256.9	249.5	242.3
3800	335.4	302.7	300.6	296.7	291.1	284.3	278.1	271.6	263.7	256.1	248.7
4000	343.8	310.2	308.1	304.1	298.4	291.3	285.1	278.3	270.3	262.4	254.9
4200	352.0	317.6	315.4	311.3	305.4	298.2	291.8	284.9	276.6	268.6	260.9
4400	359.9	324.7	322.5	318.3	312.2	304.9	298.3	291.2	282.8	274.6	266.6
4600	367.6	331.6	329.3	325.0	318.9	311.3	304.6	297.4	288.7	280.3	272.2
4800	375.0	338.3	335.9	331.6	325.3	317.6	310.7	303.3	294.5	285.9	277.7
5000	378.7	344.8	342.3	337.9	331.5	323.6	316.6	309.1	300.1	291.3	282.9
5200	378.7	351.0	348.5	344.0	337.5	329.5	322.3	314.6	305.4	296.5	287.9
CLIMB LIMIT WT (1000 KG)	306.1	306.1	306.0	302.6	295.5	286.3	278.0	268.7	257.3	246.3	236.2

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 1100 kg and climb limit weight by 1750 kg.

Takeoff Field & Climb Limit Weights - Wet Runway
Flaps 15
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
1800	211.1	190.9	188.6	185.2	181.1	177.3	173.3	168.7	164.0	159.5	155.0
2000	223.2	201.7	199.3	195.7	191.4	187.3	183.1	178.2	173.2	168.4	163.7
2200	234.4	211.9	209.2	205.5	200.9	196.7	192.2	187.1	181.9	176.8	171.8
2400	245.0	221.4	218.7	214.8	210.0	205.5	200.8	195.5	190.0	184.7	179.4
2600	254.6	230.0	227.1	223.0	218.0	213.4	208.5	202.9	197.2	191.6	186.2
2800	266.5	240.9	237.9	233.7	228.5	223.6	218.6	212.8	206.8	201.0	195.4
3000	275.1	248.5	245.4	241.0	235.6	230.6	225.3	219.3	213.1	207.1	201.2
3200	283.9	256.3	253.1	248.6	243.0	237.8	232.3	226.1	219.7	213.5	207.3
3400	292.5	264.0	260.7	256.0	250.2	244.9	239.2	232.8	226.2	219.7	213.4
3600	300.9	271.5	268.1	263.2	257.3	251.7	245.9	239.3	232.5	225.8	219.3
3800	308.8	278.7	275.2	270.2	264.1	258.4	252.4	245.6	238.5	231.7	225.1
4000	316.6	285.6	282.0	276.9	270.6	264.8	258.7	251.7	244.5	237.5	230.6
4200	324.1	292.4	288.7	283.4	277.0	271.0	264.7	257.6	250.2	243.0	236.0
4400	331.3	298.9	295.1	289.8	283.2	277.0	270.6	263.3	255.7	248.4	241.2
4600	338.4	305.2	301.4	295.9	289.1	282.9	276.3	268.8	261.1	253.6	246.2
4800	345.2	311.3	307.4	301.8	294.9	288.5	281.8	274.1	266.3	258.6	251.1
5000	351.8	317.2	313.2	307.5	300.5	293.9	287.1	279.3	271.2	263.4	255.8
5200	358.2	322.9	318.9	313.0	305.9	299.2	292.2	284.3	276.0	268.1	260.3
CLIMB LIMIT WT (1000 KG)	281.5	281.4	278.2	272.0	263.9	256.4	248.2	238.8	228.6	219.0	209.4

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or auto.
With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1900 kg.
With engine and wing anti-ice on, decrease field limit weight by 1100 kg and climb limit weight by 1750 kg.

Takeoff Obstacle Limit Weight
Flaps 15
Sea Level, 30°C & Below, Zero Wind
Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	296.6	322.2	345.4	365.3							
20	280.4	304.4	324.6	342.3	357.7	369.4					
40	262.0	286.2	305.2	321.5	335.6	348.0	358.4	366.9	373.8		
60	247.2	270.6	289.9	305.8	319.4	331.3	341.7	351.1	358.7	365.2	370.8
80	234.7	257.3	276.7	292.7	306.2	317.9	328.3	337.4	345.5	352.6	358.8
100	223.8	245.8	264.9	281.2	294.8	306.5	316.8	325.9	334.0	341.2	347.8
120	214.1	235.8	254.4	270.6	284.5	296.3	306.6	315.7	323.9	331.2	337.9
140	205.5	226.7	245.1	261.1	275.0	287.1	297.4	306.6	314.9	322.3	329.0
160	197.9	218.6	236.6	252.4	266.2	278.4	289.0	298.3	306.6	314.1	320.9
180	190.9	211.1	228.9	244.4	258.2	270.4	281.2	290.6	299.0	306.5	313.4
200	184.4	204.2	221.7	237.1	250.7	262.9	273.7	283.4	291.9	299.5	306.4
220	178.4	197.9	215.1	230.3	243.8	255.9	266.8	276.5	285.2	292.9	299.9
240	172.7	192.1	208.9	223.9	237.4	249.4	260.2	270.0	278.8	286.6	293.7
260		186.6	203.1	218.0	231.3	243.2	254.0	263.8	272.6	280.7	287.9
280		181.4	197.8	212.4	225.6	237.5	248.2	258.0	266.8	274.9	282.3
300		176.5	192.8	207.2	220.2	232.0	242.7	252.4	261.3	269.4	276.8

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
30 & Below	0	0	0	0	0	0	0
32	-2.8	-3.5	-4.2	-4.8	-5.5	-6.2	-6.9
34	-5.6	-6.9	-8.3	-9.7	-11.1	-12.4	-13.8
36	-8.3	-10.4	-12.5	-14.5	-16.6	-18.6	-20.7
38	-11.1	-13.9	-16.6	-19.4	-22.1	-24.9	-27.6
40	-13.9	-17.3	-20.8	-24.2	-27.6	-31.1	-34.5
42	-17.3	-21.5	-25.6	-29.8	-33.9	-38.1	-42.2
44	-20.8	-25.6	-30.5	-35.4	-40.2	-45.1	-49.9
46	-24.2	-29.8	-35.4	-40.9	-46.5	-52.1	-57.6
48	-27.7	-34.0	-40.2	-46.5	-52.8	-59.1	-65.4
50	-31.1	-38.1	-45.1	-52.1	-59.1	-66.1	-73.1

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
S.L. & Below	0	0	0	0	0	0	0
1000	-6.9	-8.4	-9.8	-11.2	-12.7	-14.1	-15.5
2000	-13.9	-16.8	-19.6	-22.5	-25.3	-28.2	-31.0
3000	-20.3	-24.5	-28.7	-32.8	-37.0	-41.2	-45.4
4000	-26.7	-32.2	-37.7	-43.2	-48.7	-54.2	-59.7
5000	-33.6	-40.5	-47.4	-54.3	-61.3	-68.2	-75.1
6000	-40.5	-48.8	-57.2	-65.5	-73.8	-82.2	-90.5
7000	-47.2	-57.0	-66.8	-76.7	-86.5	-96.3	-106.1
8000	-53.8	-65.2	-76.5	-87.8	-99.1	-110.4	-121.8

Takeoff Obstacle Limit Weight
Flaps 15
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
15 TW	-35.5	-36.1	-36.7	-37.3	-37.9	-38.5	-39.1
10 TW	-23.7	-24.1	-24.5	-24.9	-25.3	-25.7	-26.1
5 TW	-11.8	-12.0	-12.2	-12.4	-12.6	-12.8	-13.0
0	0	0	0	0	0	0	0
10 HW	4.0	3.8	3.6	3.4	3.2	3.0	2.8
20 HW	7.9	7.5	7.2	6.8	6.4	6.0	5.6
30 HW	12.2	11.5	10.9	10.2	9.5	8.9	8.2
40 HW	16.5	15.6	14.6	13.7	12.7	11.8	10.8

With engine bleed for packs off, increase weight by 900 kg.
With engine and wing anti-ice on, decrease weight by 2000 kg.

Tire Speed Limit
Flaps 15

AIRPORT OAT		TIRE SPEED LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
(°C)	(°F)	0	2000	4000	6000	8000
54	129	367.5	338.4	312.9	289.7	268.1
52	126	369.5	340.4	314.7	291.3	269.6
50	122	371.4	342.4	316.4	293.0	271.2
48	118	373.5	345.2	318.3	294.7	272.8
46	115	375.6	347.9	320.1	296.4	274.3
44	111	377.0	350.4	321.9	298.1	276.0
42	108	377.9	352.8	323.8	299.9	277.6
40	104	378.7	355.2	325.7	301.6	279.2
38	100	378.7	357.2	327.7	303.4	281.0
36	97	378.7	359.2	329.8	305.3	282.7
34	93	378.7	361.3	331.9	307.1	284.4
32	90	378.7	363.5	334.2	309.1	286.2
30	86	378.7	365.8	336.4	311.1	288.0
28	82	378.7	368.1	338.7	313.1	289.9
26	79	378.7	370.4	341.1	315.1	291.9
24	75	378.7	373.0	343.6	317.1	293.8
22	72	378.7	375.7	346.5	319.3	295.7
20	68	378.7	378.3	351.2	321.6	297.7
18	64	378.7	378.7	353.9	323.9	299.8
16	61	378.7	378.7	356.4	326.4	301.9
14	57	378.7	378.7	359.0	329.0	304.1
12	54	378.7	378.7	361.7	331.6	306.4
10	50	378.7	378.7	364.3	334.3	308.7
-40	-40	378.7	378.7	378.7	378.7	378.7

Increase tire speed limit weight by 2550 kg per knot headwind.
Decrease tire speed limit weight by 5400 kg per knot tailwind.

Takeoff Speeds - Dry Runway
Flaps 15
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
380	175	184	190
360	170	179	185
340	165	174	181
320	160	168	177
300	154	162	172
280	148	155	167
260	142	149	162
240	134	142	156
220	126	134	151
200	117	127	145
180	107	118	139
160	97	110	131

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	12	14					7	8					-4	-4				
60	140	8	10	12	14			4	6	7	8			-3	-3	-4	-4		
50	122	5	6	8	10	13	16	3	4	5	6	8	9	-2	-2	-3	-3	-4	-5
40	104	1	3	5	7	10	13	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4
30	86	0	0	2	5	8	11	0	0	2	3	5	7	0	0	-1	-2	-2	-3
20	68	0	0	2	4	6	9	0	0	1	2	4	6	0	0	-1	-1	-2	-3
-60	-76	0	0	2	4	6	8	0	0	1	2	4	5	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
380	-4	-1	0	3	5	-2	-1	0	0	1	3	4	4
360	-4	-1	0	3	5	-2	-1	0	0	1	3	3	4
340	-3	-1	0	3	4	-2	-1	0	0	1	2	3	3
320	-3	-1	0	2	4	-2	-1	0	0	1	2	3	3
300	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3
280	-2	-1	0	2	3	-2	-1	0	0	1	2	2	3
260	-2	0	0	2	3	-2	-1	0	0	1	2	2	3
240	-2	0	0	2	3	-1	-1	0	0	1	2	2	3
220	-1	0	0	2	3	-1	-1	0	0	1	2	3	3
200	-1	0	0	3	4	-1	0	0	0	1	2	3	4
180	-1	0	0	3	4	-1	0	1	0	1	3	3	4
160	-1	1	0	3	4	-1	0	1	0	2	3	4	5

***V1 not to exceed VR**

Takeoff Speeds - Dry Runway
Flaps 15
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	116	118	113	115	111	113	109	111				
50	122	119	121	116	118	111	113	109	111	106	109	103	106
40	104	126	127	123	124	118	120	113	115	108	111	103	106
30	86	128	130	128	130	123	125	118	120	112	115	106	109
20	68	129	130	129	130	125	126	120	122	116	118	110	113
-60	-76	130	130	130	130	126	126	121	122	117	118	112	114

Takeoff Speeds - Wet Runway
Flaps 15
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	KIAS V1	VR	V2
380	169	184	190
360	163	179	185
340	157	174	181
320	151	168	177
300	144	162	172
280	137	155	167
260	130	149	162
240	122	142	156
220	114	134	151
200	106	127	145
180	96	118	139
160	88	110	131

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1 PRESS ALT (1000 FT)						VR PRESS ALT (1000 FT)						V2 PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	14	16					7	8					-4	-4				
60	140	10	11	14	16			4	6	7	8			-3	-3	-4	-4		
50	122	5	7	9	12	14	17	3	4	5	6	8	9	-2	-2	-3	-3	-4	-5
40	104	2	3	6	8	11	14	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4
30	86	0	0	3	5	8	12	0	0	2	3	5	7	0	0	-1	-2	-2	-3
20	68	0	0	2	4	7	10	0	0	1	2	4	6	0	0	-1	-1	-2	-3
-60	-76	0	0	2	4	6	9	0	0	1	2	4	5	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%) -2	-1	0	1	2	WIND (KTS) -15	-10	-5	0	10	20	30	40
380	-6	-3	0	3	6	-3	-2	-1	0	1	2	3	4
360	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
340	-6	-3	0	3	5	-4	-3	-1	0	1	2	3	4
320	-5	-3	0	3	5	-5	-3	-2	0	1	2	3	4
300	-5	-3	0	2	5	-5	-3	-2	0	1	2	3	4
280	-5	-2	0	2	5	-5	-3	-2	0	1	2	3	4
260	-4	-2	0	2	4	-5	-3	-1	0	1	2	3	4
240	-4	-2	0	2	4	-5	-3	-1	0	1	3	4	5
220	-3	-1	0	3	4	-5	-3	-1	0	1	3	4	5
200	-2	-1	0	3	5	-4	-2	-1	0	2	3	4	5
180	-2	0	0	3	5	-4	-2	0	0	2	4	5	6
160	-1	1	0	4	5	-3	-2	0	0	2	4	6	7

***V1 not to exceed VR**

Takeoff Speeds - Wet Runway
Flaps 15
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	116	118	113	115	111	113	109	111				
50	122	119	121	116	118	111	113	109	111	106	109	103	106
40	104	126	127	123	124	118	120	113	115	108	111	103	106
30	86	128	130	128	130	123	125	118	120	112	115	106	109
20	68	129	130	129	130	125	126	120	122	116	118	110	113
-60	-76	130	130	130	130	126	126	121	122	117	118	112	114

Performance Dispatch — Chapter PD
Enroute — Section 41

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Forward C.G. (7.5% MAC - FMC Default)

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	4	30400	28700	27200
350	28500	3	31000	29400	27800
340	29200	1	31600	30000	28500
330	29800	0	32100	30500	29000
320	30500	-2	32600	31000	29500
310	31200	-3	33200	31600	30000
300	31900	-5	33700	32100	30600
290	32600	-7	34300	32700	31200
280	33400	-8	34900	33300	31800
270	34100	-10	35500	33900	32400
260	34900	-12	36100	34500	33100
250	35800	-14	36800	35200	33800
240	36600	-15	37500	35900	34500
230	37500	-15	38200	36600	35200
220	38400	-15	39000	37400	36000
210	39400	-15	39700	38200	36800
200	40400	-15	40600	39100	37700
190	41500	-15	41500	39900	38600
180	42600	-15	42400	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42100

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	10	30400	28700	27200
350	28500	8	31000	29400	27800
340	29200	7	31600	30000	28500
330	29800	5	32100	30500	29000
320	30500	4	32600	31000	29500
310	31200	2	33200	31600	30000
300	31900	1	33700	32100	30600
290	32600	-1	34300	32700	31200
280	33400	-3	34900	33300	31800
270	34100	-4	35500	33900	32400
260	34900	-6	36100	34500	33100
250	35800	-8	36800	35200	33800
240	36600	-9	37500	35900	34500
230	37500	-9	38200	36600	35200
220	38400	-9	39000	37400	36000
210	39400	-9	39700	38200	36800
200	40400	-9	40600	39100	37700
190	41500	-9	41500	39900	38600
180	42600	-9	42400	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42100

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Forward C.G. (7.5% MAC - FMC Default)
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	15	30400	28700	27200
350	28500	14	31000	29400	27800
340	29200	13	31600	30000	28500
330	29800	11	32100	30500	29000
320	30500	10	32600	31000	29500
310	31200	8	33200	31600	30000
300	31900	6	33700	32100	30600
290	32600	5	34300	32700	31200
280	33400	3	34900	33300	31800
270	34100	1	35500	33900	32400
260	34900	-1	36100	34500	33100
250	35800	-2	36800	35200	33800
240	36600	-3	37500	35900	34500
230	37500	-3	38200	36600	35200
220	38400	-3	39000	37400	36000
210	39400	-3	39700	38200	36800
200	40400	-3	40600	39100	37700
190	41500	-3	41500	39900	38600
180	42600	-3	42400	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42100

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Mid C.G. (30% MAC)
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	4	31400	29800	28200
350	28500	3	32100	30400	28900
340	29200	1	32700	31000	29500
330	29800	0	33200	31500	30000
320	30500	-2	33700	32100	30500
310	31200	-3	34200	32600	31100
300	31900	-5	34700	33100	31600
290	32600	-7	35300	33700	32200
280	33400	-8	35900	34300	32800
270	34100	-10	36500	34900	33400
260	34900	-12	37100	35500	34100
250	35800	-14	37800	36200	34800
240	36600	-15	38500	36900	35500
230	37500	-15	39200	37600	36200
220	38400	-15	40000	38400	37000
210	39400	-15	40700	39200	37800
200	40400	-15	41600	40000	38600
190	41500	-15	42500	40900	39500
180	42600	-15	43100	41900	40500
170	43100	-15	43100	43100	41700
160	43100	-15	43100	43100	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	10	31400	29800	28200
350	28500	8	32100	30400	28900
340	29200	7	32700	31000	29500
330	29800	5	33200	31500	30000
320	30500	4	33700	32100	30500
310	31200	2	34200	32600	31100
300	31900	1	34700	33100	31600
290	32600	-1	35300	33700	32200
280	33400	-3	35900	34300	32800
270	34100	-4	36500	34900	33400
260	34900	-6	37100	35500	34100
250	35800	-8	37800	36200	34800
240	36600	-9	38500	36900	35500
230	37500	-9	39200	37600	36200
220	38400	-9	40000	38400	37000
210	39400	-9	40700	39200	37800
200	40400	-9	41600	40000	38600
190	41500	-9	42500	40900	39500
180	42600	-9	43100	41900	40500
170	43100	-9	43100	43100	41700
160	43100	-9	43100	43100	43000

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Mid C.G. (30% MAC)
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	15	31300*	29800	28200
350	28500	14	32000*	30400	28900
340	29200	13	32700	31000	29500
330	29800	11	33200	31500	30000
320	30500	10	33700	32100	30500
310	31200	8	34200	32600	31100
300	31900	6	34700	33100	31600
290	32600	5	35300	33700	32200
280	33400	3	35900	34300	32800
270	34100	1	36500	34900	33400
260	34900	-1	37100	35500	34100
250	35800	-2	37800	36200	34800
240	36600	-3	38500	36900	35500
230	37500	-3	39200	37600	36200
220	38400	-3	40000	38400	37000
210	39400	-3	40700	39200	37800
200	40400	-3	41600	40000	38600
190	41500	-3	42500	40900	39500
180	42600	-3	43100	41900	40500
170	43100	-3	43100	43100	41700
160	43100	-3	43100	43100	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1058	994	937	886	841	800	766	735	706	679	655
1580	1487	1403	1328	1261	1200	1150	1104	1061	1021	985
2101	1979	1868	1769	1681	1600	1534	1473	1416	1364	1316
2620	2469	2332	2210	2100	2000	1918	1842	1771	1706	1647
3138	2959	2795	2650	2520	2400	2302	2211	2127	2049	1978
3654	3447	3258	3090	2939	2800	2687	2581	2483	2392	2309
4168	3933	3719	3529	3358	3200	3071	2950	2838	2735	2641
4679	4418	4180	3968	3776	3600	3455	3320	3194	3078	2972
5190	4903	4640	4406	4194	4000	3839	3689	3550	3421	3303
5699	5386	5099	4844	4612	4400	4224	4059	3906	3764	3635
6207	5868	5558	5281	5030	4800	4608	4429	4262	4108	3966
6713	6348	6015	5717	5448	5200	4992	4798	4618	4451	4298
7217	6828	6472	6153	5865	5600	5376	5168	4973	4794	4629
7721	7307	6928	6590	6283	6000	5761	5537	5329	5137	4960
8224	7786	7385	7026	6700	6400	6145	5906	5685	5480	5292
8726	8264	7841	7461	7117	6800	6529	6276	6040	5823	5623
9228	8742	8296	7897	7534	7200	6913	6645	6396	6166	5955
9728	9219	8751	8332	7951	7600	7297	7015	6752	6509	6286
10228	9695	9206	8767	8368	8000	7681	7384	7107	6852	6617

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	27		29		31		33		35	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
800	13.3	2:02	13.0	2:00	12.8	1:57	12.6	1:54	12.4	1:52
1200	19.3	2:58	18.9	2:54	18.5	2:50	18.2	2:46	17.9	2:43
1600	25.5	3:53	24.9	3:49	24.4	3:42	23.9	3:37	23.4	3:33
2000	31.6	4:49	30.8	4:43	30.2	4:35	29.6	4:28	28.9	4:23
2400	38.0	5:43	37.1	5:35	36.3	5:26	35.5	5:18	34.6	5:13
2800	44.4	6:37	43.3	6:28	42.3	6:17	41.4	6:08	40.4	6:03
3200	51.0	7:30	49.7	7:19	48.5	7:07	47.4	6:58	46.2	6:53
3600	57.7	8:23	56.2	8:11	54.9	7:58	53.5	7:47	52.2	7:42
4000	64.4	9:15	62.7	9:02	61.2	8:48	59.7	8:37	58.2	8:32
4400	71.4	10:06	69.5	9:52	67.8	9:37	66.1	9:26	64.5	9:22
4800	78.4	10:58	76.3	10:42	74.3	10:26	72.4	10:16	70.7	10:11
5200	85.5	11:48	83.2	11:31	81.0	11:16	79.0	11:05	77.2	11:01
5600	92.8	12:38	90.3	12:20	87.9	12:04	85.7	11:54	84.0	11:51
6000	100.1	13:28	97.4	13:10	94.7	12:53	92.3	12:43	90.7	12:41
6400	107.7	14:17	104.7	13:58	101.8	13:42	99.4	13:33	98.0	13:30
6800	115.3	15:06	112.0	14:47	109.0	14:31	106.5	14:22	105.4	14:20
7200	123.1	15:55	119.5	15:36	116.3	15:20	113.9	15:11	113.1	15:10
7600	131.0	16:43	127.2	16:24	123.8	16:09	121.5	16:01	121.3	16:00
8000	138.9	17:31	134.8	17:12	131.3	16:58	129.2	16:50	129.4	16:50

Long Range Cruise Trip Fuel and Time
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)					
	160	180	200	220	240	260
10	-1.0	-0.5	0.0	0.6	1.3	1.9
20	-2.1	-1.0	0.0	1.1	2.3	4.0
30	-3.1	-1.6	0.0	1.7	3.8	6.7
40	-4.2	-2.2	0.0	2.4	5.5	9.8
50	-5.4	-2.8	0.0	3.3	7.5	13.5
60	-6.5	-3.3	0.0	4.3	9.9	17.8
70	-7.6	-3.9	0.0	5.4	12.6	22.5
80	-8.8	-4.5	0.0	6.7	15.6	27.8
90	-9.9	-5.1	0.0	8.1	19.0	33.7
100	-11.1	-5.7	0.0	9.6	22.6	40.1
110	-12.3	-6.2	0.0	11.3	26.6	47.0
120	-13.5	-6.8	0.0	13.1	30.9	54.4
130	-14.7	-7.4	0.0	15.0	35.5	62.4
140	-15.9	-8.0	0.0	17.1	40.4	70.9
150	-17.1	-8.6	0.0	19.4	45.7	80.0

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
1040	981	928	881	839	800	765	732	703	675	650
1545	1461	1386	1318	1256	1200	1149	1102	1058	1018	981
2050	1941	1843	1754	1673	1600	1533	1471	1414	1361	1312
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643
3060	2900	2757	2626	2508	2400	2301	2209	2125	2047	1974
3564	3380	3213	3063	2925	2800	2685	2579	2481	2390	2306
4068	3859	3670	3499	3343	3200	3069	2948	2837	2733	2637
4572	4338	4127	3935	3760	3600	3453	3318	3193	3077	2969
5076	4817	4583	4371	4177	4000	3837	3687	3549	3420	3300
5580	5296	5039	4807	4594	4400	4221	4057	3905	3763	3632
6083	5775	5496	5242	5011	4800	4606	4426	4261	4107	3964
6587	6253	5952	5678	5429	5200	4990	4796	4617	4450	4296
7090	6732	6408	6114	5846	5600	5374	5166	4973	4794	4628
7593	7210	6864	6550	6263	6000	5758	5536	5329	5138	4960
8095	7688	7320	6985	6680	6400	6143	5905	5686	5482	5292
8598	8166	7776	7421	7097	6800	6527	6275	6042	5826	5624
9100	8644	8231	7856	7514	7200	6911	6645	6398	6169	5956
9602	9122	8687	8292	7931	7600	7296	7015	6755	6513	6289
10104	9599	9142	8727	8348	8000	7680	7385	7111	6858	6621

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG) 160	170	180	190	200	210	220	230	240	250	260	TIME (HRS:MIN)
800	10.4	10.8	11.2	11.6	12.2	12.6	13.0	13.4	13.9	14.5	14.9	1:50
1200	14.8	15.3	15.9	16.6	17.4	18.0	18.6	19.3	20.1	20.9	21.4	2:40
1600	19.2	20.0	20.8	21.7	22.8	23.6	24.4	25.3	26.4	27.4	28.1	3:30
2000	23.7	24.7	25.7	27.0	28.2	29.2	30.3	31.5	32.9	34.0	35.0	4:20
2400	28.3	29.5	30.8	32.3	33.7	35.0	36.3	37.9	39.4	40.8	42.0	5:10
2800	33.0	34.4	36.0	37.7	39.4	40.9	42.6	44.3	46.0	47.7	49.2	5:59
3200	37.8	39.4	41.3	43.2	45.1	46.9	48.9	50.9	52.8	54.8	56.6	6:49
3600	42.6	44.6	46.7	48.9	51.1	53.2	55.4	57.6	59.8	62.0	64.1	7:38
4000	47.6	49.9	52.2	54.6	57.1	59.6	62.0	64.4	66.9	69.5	71.8	8:28
4400	52.8	55.3	57.9	60.5	63.4	66.0	68.7	71.4	74.2	77.1	79.6	9:17
4800	58.0	60.8	63.6	66.6	69.8	72.6	75.5	78.6	81.7	84.8	87.6	10:06
5200	63.4	66.4	69.5	72.8	76.2	79.3	82.5	85.9	89.4	92.7	95.7	10:56
5600	68.8	72.1	75.5	79.2	82.8	86.2	89.7	93.5	97.2	100.7	104.1	11:45
6000	74.4	77.9	81.7	85.7	89.6	93.2	97.1	101.1	105.1	109.0	112.7	12:34
6400	80.0	83.9	88.0	92.3	96.4	100.5	104.7	109.0	113.2	117.4	121.4	13:23
6800	85.8	90.0	94.5	99.0	103.5	107.9	112.4	116.9	121.5	126.0	130.3	14:12
7200	91.7	96.4	101.1	105.8	110.7	115.5	120.2	125.0	129.9	134.8	139.5	15:01
7600	97.8	102.8	107.8	112.8	118.1	123.2	128.2	133.4	138.6	143.9	148.8	15:50
8000	104.1	109.3	114.6	120.1	125.7	131.0	136.4	141.9	147.6	153.1	158.3	16:39

Based on 310/.84 climb, LRC and .84/310/250 descent.
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
96	81	70	62	55	50	46	42	39	36	34
160	143	129	118	108	100	93	87	82	77	73
224	204	187	173	161	150	141	133	125	119	113
287	264	244	227	213	200	189	178	169	161	154
348	323	301	282	265	250	237	225	214	204	195
410	382	357	336	317	300	285	271	259	247	237
471	440	414	390	369	350	333	317	303	290	279
533	499	470	444	421	400	381	364	348	334	320
595	559	527	499	473	450	429	410	393	376	362
660	620	585	554	525	500	477	456	437	419	403

Trip Fuel and Time Required

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)						TIME (HRS:MIN)
		160	180	200	220	240	260	
50	FUEL (1000 KG)	1.7	1.8	1.9	2.0	2.1	2.2	0:14
	ALT (FT)	11000	11000	9000	9000	7000	5000	
100	FUEL (1000 KG)	2.5	2.6	2.8	2.9	3.1	3.2	0:22
	ALT (FT)	15000	15000	13000	13000	13000	13000	
150	FUEL (1000 KG)	3.3	3.4	3.6	3.8	4.0	4.2	0:30
	ALT (FT)	23000	23000	23000	21000	21000	21000	
200	FUEL (1000 KG)	3.9	4.1	4.4	4.6	4.9	5.1	0:36
	ALT (FT)	29000	27000	27000	27000	25000	23000	
250	FUEL (1000 KG)	4.5	4.8	5.1	5.4	5.7	6.0	0:42
	ALT (FT)	37000	31000	29000	29000	27000	29000	
300	FUEL (1000 KG)	5.1	5.4	5.8	6.1	6.5	6.8	0:48
	ALT (FT)	43000	39000	37000	37000	35000	33000	
350	FUEL (1000 KG)	5.6	6.0	6.4	6.8	7.2	7.6	0:54
	ALT (FT)	43000	41000	39000	37000	35000	33000	
400	FUEL (1000 KG)	6.1	6.6	7.0	7.5	7.9	8.4	1:00
	ALT (FT)	43000	41000	39000	37000	35000	33000	
450	FUEL (1000 KG)	6.6	7.1	7.7	8.2	8.7	9.2	1:06
	ALT (FT)	43000	41000	39000	37000	35000	35000	
500	FUEL (1000 KG)	7.1	7.7	8.3	8.8	9.4	10.0	1:13
	ALT (FT)	43000	41000	39000	37000	35000	35000	

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	9490	9380	9290	9600	9920	10280	10770			
340	8960	8880	8770	8910	9320	9600	9950			
320	8440	8360	8250	8260	8720	8910	9200			
300	7930	7840	7730	7700	8040	8270	8540			
280	7430	7330	7220	7180	7340	7660	7890			
260	6940	6830	6710	6660	6690	7070	7250	7490		
240	6490	6360	6210	6140	6140	6390	6610	6810		
220	6070	5920	5740	5660	5640	5710	6000	6170		
200	5670	5500	5310	5230	5170	5150	5390	5540	5850	
180	5270	5110	4900	4820	4730	4780	4700	4930	5180	
160	5010	4840	4630	4520	4410	4340	4320	4360	4540	4670

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	10360	10330	10290	10380	10610
340	9740	9690	9630	9670	9890
320	9140	9080	9020	9030	9220
300	8560	8490	8420	8420	8570
280	7980	7920	7820	7810	7900
260	7430	7340	7230	7220	7270
240	6890	6780	6660	6630	6660
220	6390	6250	6110	6060	6060
200	5910	5750	5580	5500	5480
180	5460	5280	5090	4990	4940
160	5120	4950	4730	4620	4550

These tables include 5% additional fuel for holding in a racetrack pattern.

Oxygen Requirements

Passenger Oxygen System - Gaseous

Table 1

NO. OF OCCUPANTS IN PASSENGER CABIN	MINIMUM POST DECOMPRESSION TIME (MINUTES)	PRESSURE ALTITUDE AT DECOMPRESSION (FT)				
		27000	31000	35000	39000	43000
		LITERS REQUIRED				
100	10*	1290	1459	1671	1890	1985
200		2577	2918	3286	3710	3895
300		3866	4377	4901	5530	5805
400		5154	5836	6516	7350	7720
500		6443	7295	8131	9171	9630

***Minimum post decompression time (10 min) approximates direct descent to 10000 ft pressure altitude.**

Table 2

NO. OF OCCUPANTS IN PASSENGER CABIN	ADDITIONAL OXYGEN REQUIRED (LITERS PER MINUTE ABOVE 10000 FT PRESSURE ALTITUDE)										
	INTERMEDIATE PRESSURE ALTITUDE										
	11000*	12000*	13000**	14000**	15000**	16000	17000	18000	19000	21000	25000
100	11	10	29	27	32	115	120	125	140	165	230
200	21	20	57	54	65	230	240	250	280	330	460
300	32	30	86	81	95	345	360	375	420	495	690
400	42	40	114	108	126	460	480	500	560	660	920
500	53	50	143	135	158	575	600	625	700	825	1150

Total oxygen quantity required is:
Direct emergency descent from initial cruise altitude down to 10000 ft (from Table 1) plus level off and cruise at intermediate altitude above 10000 ft if applicable (from Table 2).
***10% of cabin occupants using oxygen.**
****30% of cabin occupants using oxygen.**

Oxygen Requirements

Passenger Oxygen System - Gaseous

Cylinder Volume to Pressure Conversion

Table 3

CYLINDER PRESSURE @21°C (PSI)	OXYGEN CYLINDERS (1000 LITERS)																				
	NUMBER OF 115 CUBIC FOOT BOTTLES INSTALLED																				
	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
100			.1	.1	.1	.1	.2	.2	.2	.2	.3	.3	.3	.3	.4	.4	.4	.4	.5	.5	.5
200	.1	.3	.7	.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3
300	.3	.7	1.4	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.8	5.2	5.5	5.9	6.3	6.7	7.0	7.4	7.8	8.1
400	.5	1.0	2.1	2.7	3.2	3.8	4.3	4.9	5.4	6.0	6.5	7.0	7.6	8.1	8.7	9.2	9.8	10.3	10.9	11.4	12.0
500	.7	1.4	2.8	3.5	4.3	5.0	5.7	6.4	7.1	7.9	8.6	9.3	10.0	10.7	11.5	12.2	12.9	13.6	14.3	15.1	15.8
600	.8	1.7	3.5	4.4	5.3	6.2	7.1	8.0	8.9	9.8	10.7	11.6	12.4	13.3	14.2	15.1	16.0	16.9	17.8	18.7	19.6
700	1.0	2.1	4.2	5.3	6.3	7.4	8.5	9.5	10.6	11.7	12.7	13.8	14.9	15.9	17.0	18.1	19.1	20.2	21.3	22.3	23.4
800	1.2	2.4	4.9	6.1	7.4	8.6	9.9	11.1	12.3	13.6	14.8	16.1	17.3	18.5	19.8	21.0	22.3	23.5	24.7	26.0	27.2
900	1.4	2.8	5.6	7.0	8.4	9.8	11.3	12.7	14.1	15.5	16.9	18.3	19.7	21.1	22.6	24.0	25.4	26.8	28.2	29.6	31.0
1000	1.5	3.1	6.3	7.9	9.5	11.1	12.6	14.2	15.8	17.4	19.0	20.6	22.2	23.7	25.3	26.9	28.5	30.1	31.7	33.3	34.8
1100	1.7	3.5	7.0	8.7	10.5	12.3	14.0	15.8	17.5	19.3	21.1	22.8	24.6	26.3	28.1	29.9	31.6	33.4	35.1	36.9	38.7
1200	1.9	3.8	7.7	9.6	11.5	13.5	15.4	17.3	19.3	21.2	23.1	25.1	27.0	28.9	30.9	32.8	34.7	36.7	38.6	40.5	42.5
1300	2.1	4.2	8.4	10.5	12.6	14.7	16.8	18.9	21.0	23.1	25.2	27.3	29.4	31.5	33.6	35.8	37.9	40.0	42.1	44.2	46.3
1400	2.2	4.5	9.1	11.3	13.6	15.9	18.2	20.5	22.7	25.0	27.3	29.6	31.9	34.1	36.4	38.7	41.0	43.3	45.5	47.8	50.1
1500	2.4	4.9	9.8	12.2	14.7	17.1	19.6	22.0	24.5	26.9	29.4	31.8	34.3	36.7	39.2	41.6	44.1	46.5	49.0	51.5	53.9
1600	2.6	5.2	10.5	13.1	15.7	18.3	21.0	23.6	26.2	28.8	31.5	34.1	36.7	39.3	42.0	44.6	47.2	49.8	52.5	55.1	57.7
1700	2.7	5.5	11.1	13.9	16.7	19.5	22.3	25.1	27.9	30.7	33.5	36.3	39.1	41.9	44.7	47.5	50.3	53.1	55.9	58.7	61.5
1800	2.9	5.9	11.8	14.8	17.8	20.8	23.7	26.7	29.7	32.6	35.6	38.6	41.6	44.5	47.5	50.5	53.5	56.4	59.4	62.4	65.3
1900	3.1	6.2	12.5	15.7	18.8	22.0	25.1	28.3	31.4	34.6	37.7	40.8	44.0	47.1	50.3	53.4	56.6	59.7	62.9	66.0	69.2
2000	3.3	6.6	13.2	16.5	19.9	23.2	26.5	29.8	33.1	36.5	39.8	43.1	46.4	49.7	53.1	56.4	59.7	63.0	66.3	69.7	73.0
	CREW-SYSTEM		PASSENGER SYSTEM																		

Check maximum pressure in shaded area.
Maximum cylinder pressure = 1850 PSI at 21°C.

Temperature corrections

Table 4

CYLINDER PRESSURE AT 21°C	PRESSURE CORRECTION FOR EACH 5°C PSI
400	7
600	11
800	14
1000	17
1200	21
1400	24
1600	28
1800	31
2000	34

If ambient temperature above 21°C, add increment shown.
If ambient temperature below 21°C, subtract increment shown.

Crew Oxygen Requirements

Table 1

NUMBER OF CREW	OXYGEN REQUIRED (LITERS)
2	660
3	990
4	1320

Table 2

NUMBER OF CREW	OXYGEN REQUIRED FOR LEVEL OFF AT 14000 FT (LITERS)			
	TOTAL POST DECOMPRESSION TIME (HR)			
	2	3	4	5
2	660	960	1270	1570
3	980	1440	1900	2360
4	1310	1920	2530	3140

Table 3

NUMBER OF CREW	ADDITIONAL LITERS REQUIRED FOR EACH MINUTE HELD AT INTERMEDIATE ALTITUDE OTHER THAN 14000 FT				
	INTERMEDIATE PRESSURE ALTITUDE (FT				
	UP TO 13999	14000	14001 TO 17999	18000 TO 21999	22000 TO 25000
	REGULATOR ON "NORMAL" OR (100%)				
2	0 (22)	0 (17)	1 (16)	3 (12)	6 (10)
3	0 (33)	0 (25)	2 (24)	5 (18)	8 (15)
4	0 (44)	0 (34)	2 (32)	6 (24)	11 (20)

For more extensive than normal crew usage, add 2.05 liters/person/minute for each crew member at 8000 ft cabin altitude when regulator setting is NORMAL; or 13 liters/person/minute when regulator setting is 100%.

Instructions:

1. **Determine protective breathing requirements from Table 1.**
2. **Determine supplemental requirements for level off at 14000 ft from Table 2 and correct for level off altitudes other than 14000 ft using Table 3.**
3. **Flight crew system oxygen requirements are the larger of protective breathing (Table 1) or supplemental requirements (Table 2).**

Crew Oxygen Requirements

Table 4 - Cylinder Volume to Pressure Conversion

OXYGEN VOLUME (1000 LITERS)	CYLINDER PRESSURE AT 21°C (PSI)
.3	200
.7	300
1.0	400
1.4	500
1.7	600
2.1	700
2.4	800
2.8	900
3.1	1000
3.5	1100
3.8	1200
4.2	1300
4.5	1400
4.9	1500
5.2	1600
5.5	1700
5.9	1800
6.2	1900
6.6	2000

Check maximum pressure in shaded area. Maximum cylinder pressure = 1850 PSI at 21°C. For maximum cylinder pressure at hotter or colder temperatures, add or subtract 32 PSI per 5°C, respectively.

Table 5 - Temperature Corrections

CYLINDER PRESSURE AT 21°C (PSI)	PRESSURE CORRECTION FOR EACH 5°C ABOVE/BELOW 21°C (PSI)
400	+7/-7
600	+11/-11
800	+14/-14
1000	+17/-17
1200	+21/-21
1400	+24/-24
1600	+28/-28
1800	+31/-31
2000	+34/-34

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
30	181.1	179.2	173.7
28	195.4	191.0	184.0
26	210.7	205.0	197.4
24	227.1	219.9	212.1
22	244.3	236.6	228.1
20	268.7	262.0	252.1
18	291.1	282.3	271.4
16	315.5	304.7	292.9
14	337.0	324.3	311.2
12	358.8	345.0	331.5
10	378.0	363.8	348.4

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	14	16	18	20	22	24	26	28	30
ENGINE ONLY	-0.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE AND WING	-2.6	-1.8	-1.5	-1.0	-1.2	-1.2	-1.2	-1.3	-1.2

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
282	261	242	226	212	200	189	179	170	162	155
565	522	485	453	425	400	378	358	340	324	310
847	783	727	679	637	600	567	537	511	486	464
1130	1044	970	906	850	800	756	716	681	649	619
1412	1304	1212	1132	1062	1000	945	895	851	811	774
1694	1565	1455	1359	1274	1200	1134	1075	1021	973	929
1977	1826	1697	1585	1487	1400	1323	1254	1191	1135	1084
2259	2087	1939	1811	1699	1600	1512	1433	1362	1297	1239
2541	2348	2182	2038	1912	1800	1701	1612	1532	1459	1393
2824	2609	2424	2264	2124	2000	1890	1791	1702	1622	1548
3106	2870	2667	2491	2336	2200	2079	1970	1872	1784	1703
3389	3131	2909	2717	2549	2400	2268	2149	2042	1946	1858
3671	3392	3152	2943	2761	2600	2457	2328	2213	2108	2013
3953	3652	3394	3170	2973	2800	2646	2507	2383	2270	2168
4236	3913	3637	3396	3186	3000	2835	2687	2553	2432	2322

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)									
	180	200	220	240	260	280	300	320	340	360
200	4.4	4.6	4.9	5.1	5.3	5.5	5.7	5.9	6.1	6.3
400	8.1	8.4	8.8	9.2	9.6	9.9	10.3	10.6	10.9	11.3
600	11.7	12.2	12.7	13.2	13.8	14.3	14.8	15.3	15.8	16.3
800	15.4	16.0	16.6	17.3	18.0	18.6	19.3	19.9	20.5	21.2
1000	19.0	19.8	20.6	21.4	22.2	23.0	23.7	24.5	25.3	26.1
1200	22.6	23.4	24.4	25.4	26.4	27.3	28.2	29.1	30.0	31.0
1400	26.1	27.1	28.2	29.3	30.4	31.6	32.6	33.6	34.7	35.8
1600	29.6	30.8	32.0	33.2	34.5	35.8	37.0	38.1	39.3	40.6
1800	33.1	34.4	35.8	37.2	38.6	40.0	41.3	42.6	43.9	45.3
2000	36.6	38.1	39.6	41.1	42.6	44.2	45.7	47.1	48.5	50.0
2200	40.0	41.6	43.3	44.9	46.6	48.3	50.0	51.5	53.1	54.7
2400	43.4	45.1	46.9	48.7	50.5	52.4	54.2	55.9	57.6	59.3
2600	46.8	48.7	50.6	52.5	54.5	56.4	58.4	60.2	62.0	63.9
2800	50.2	52.2	54.2	56.3	58.4	60.5	62.6	64.5	66.5	68.5
3000	53.6	55.7	57.9	60.1	62.3	64.6	66.8	68.9	71.0	73.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (3%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engine cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	227	213	200	189	179	170	162	155
570	526	487	454	425	400	377	357	339	323	308
857	790	732	682	638	600	566	536	508	484	462
1144	1053	976	909	851	800	755	714	678	645	615
1431	1317	1221	1137	1064	1000	943	892	847	806	769
1718	1581	1465	1365	1277	1200	1132	1071	1016	967	922
2005	1845	1709	1592	1490	1400	1320	1249	1185	1128	1075
2292	2109	1954	1820	1703	1600	1509	1428	1355	1289	1229
2579	2373	2198	2047	1916	1800	1697	1606	1524	1450	1382
2866	2637	2443	2275	2129	2000	1886	1784	1693	1611	1536
3153	2901	2687	2502	2342	2200	2075	1963	1862	1772	1689
3440	3165	2932	2730	2554	2400	2263	2141	2032	1933	1843
3727	3429	3176	2958	2767	2600	2452	2320	2201	2094	1996
4014	3693	3421	3185	2980	2800	2640	2498	2370	2255	2150
4300	3957	3665	3413	3193	3000	2829	2676	2539	2416	2303

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)									
	180	200	220	240	260	280	300	320	340	360
200	4.2	4.5	4.8	5.1	5.3	5.5	5.8	6.0	6.3	6.5
400	7.8	8.3	8.8	9.3	9.7	10.2	10.6	11.1	11.5	11.9
600	11.4	12.0	12.7	13.4	14.0	14.7	15.4	16.0	16.6	17.2
800	14.9	15.8	16.7	17.5	18.4	19.2	20.0	20.9	21.7	22.5
1000	18.5	19.6	20.6	21.7	22.7	23.7	24.7	25.7	26.7	27.6
1200	21.9	23.2	24.5	25.7	27.0	28.2	29.3	30.6	31.7	32.8
1400	25.2	26.7	28.3	29.7	31.1	32.5	33.9	35.3	36.6	38.0
1600	28.6	30.3	32.0	33.7	35.2	36.8	38.4	39.9	41.5	43.0
1800	32.0	33.9	35.8	37.6	39.4	41.1	42.8	44.6	46.3	48.0
2000	35.4	37.4	39.5	41.6	43.5	45.4	47.3	49.3	51.2	53.0
2200	38.6	40.9	43.2	45.4	47.5	49.6	51.7	53.8	55.9	57.9
2400	41.8	44.2	46.7	49.1	51.5	53.7	56.0	58.3	60.5	62.7
2600	45.0	47.6	50.3	52.9	55.4	57.9	60.3	62.8	65.2	67.6
2800	48.2	51.0	53.9	56.7	59.4	62.0	64.6	67.2	69.9	72.4
3000	51.3	54.3	57.4	60.4	63.3	66.1	68.8	71.6	74.4	77.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
261	246	232	220	209	200	191	182	175	168	162
523	492	465	441	419	400	381	365	350	336	323
786	740	699	662	629	600	572	547	525	504	484
1050	988	933	884	840	800	763	730	699	671	645
1316	1237	1168	1106	1050	1000	954	912	874	838	806
1582	1487	1403	1328	1260	1200	1144	1094	1048	1005	966
1848	1737	1638	1550	1471	1400	1335	1276	1222	1172	1126
2116	1987	1874	1772	1682	1600	1525	1457	1395	1338	1286
2383	2238	2110	1995	1892	1800	1715	1639	1569	1505	1445
2651	2489	2346	2218	2103	2000	1906	1820	1742	1671	1605
2920	2740	2582	2440	2314	2200	2096	2002	1916	1837	1764
3188	2992	2818	2663	2524	2400	2286	2183	2089	2003	1924
3457	3243	3054	2886	2735	2600	2477	2365	2263	2169	2083
3726	3494	3290	3109	2946	2800	2667	2546	2436	2335	2242
3994	3746	3526	3331	3157	3000	2857	2728	2610	2501	2401

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)									
	180	200	220	240	260	280	300	320	340	360
200	4.9	5.2	5.4	5.6	5.8	6.0	6.3	6.4	6.7	7.0
400	7.9	8.4	8.9	9.4	9.9	10.3	10.8	11.3	11.9	12.5
600	10.6	11.4	12.3	13.0	13.7	14.4	15.2	16.0	16.9	17.8
800	13.4	14.5	15.5	16.5	17.5	18.5	19.5	20.6	21.8	23.0
1000	16.1	17.4	18.8	20.0	21.3	22.5	23.8	25.1	26.6	28.1
1200	18.7	20.3	21.9	23.5	25.0	26.5	28.0	29.6	31.4	33.1
1400	21.3	23.2	25.1	26.9	28.6	30.4	32.2	34.0	36.1	38.1
1600	23.9	26.0	28.1	30.2	32.2	34.3	36.3	38.4	40.7	43.0
1800	26.5	28.8	31.2	33.5	35.8	38.1	40.4	42.7	45.3	47.9
2000	29.0	31.6	34.2	36.8	39.3	41.9	44.4	47.0	49.8	52.7
2200	31.5	34.3	37.2	40.0	42.8	45.6	48.3	51.2	54.3	57.4
2400	33.9	37.0	40.1	43.2	46.3	49.3	52.3	55.4	58.7	62.1
2600	36.3	39.7	43.0	46.4	49.7	53.0	56.2	59.5	63.1	66.7
2800	38.7	42.3	45.9	49.5	53.1	56.6	60.0	63.6	67.5	71.3
3000	41.1	44.9	48.7	52.6	56.4	60.2	63.8	67.6	71.7	75.8

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (12%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Decompression Critical Fuel Reserves - 320 KIAS Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
292	267	246	229	213	200	188	178	168	160	152
566	523	485	453	425	400	378	358	340	324	309
840	778	724	678	636	600	568	538	512	488	467
1115	1034	963	902	848	800	757	719	684	653	624
1390	1289	1202	1126	1059	1000	947	899	856	817	781
1664	1545	1441	1351	1271	1200	1137	1080	1028	981	938
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1096
2213	2056	1919	1799	1694	1600	1516	1440	1372	1310	1253
2488	2311	2158	2024	1905	1800	1706	1621	1544	1474	1410
2763	2567	2397	2248	2117	2000	1895	1801	1716	1638	1567
3037	2822	2636	2473	2328	2200	2085	1981	1888	1802	1725
3312	3078	2875	2697	2540	2400	2275	2162	2060	1967	1882
3587	3334	3114	2921	2751	2600	2464	2342	2232	2131	2039
3861	3589	3353	3146	2963	2800	2654	2523	2404	2295	2196
4136	3845	3592	3370	3174	3000	2844	2703	2576	2460	2354

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)									
	180	200	220	240	260	280	300	320	340	360
200	4.6	4.7	4.9	5.1	5.3	5.6	5.8	6.0	6.3	6.5
400	8.7	8.9	9.2	9.5	9.8	10.2	10.6	11.0	11.4	11.9
600	12.7	13.0	13.4	13.8	14.3	14.8	15.3	15.9	16.6	17.2
800	16.8	17.2	17.6	18.1	18.7	19.3	20.0	20.8	21.6	22.4
1000	20.9	21.3	21.8	22.4	23.1	23.9	24.7	25.6	26.6	27.6
1200	24.9	25.4	26.0	26.7	27.5	28.4	29.4	30.4	31.6	32.8
1400	28.9	29.4	30.1	30.9	31.8	32.8	34.0	35.2	36.5	37.9
1600	33.0	33.5	34.2	35.1	36.1	37.2	38.5	39.9	41.3	42.9
1800	37.0	37.6	38.4	39.3	40.4	41.7	43.0	44.5	46.2	47.9
2000	41.0	41.7	42.5	43.5	44.7	46.1	47.6	49.2	51.0	52.9
2200	45.0	45.7	46.6	47.6	48.9	50.4	52.0	53.8	55.7	57.8
2400	49.0	49.7	50.7	51.8	53.1	54.7	56.4	58.3	60.4	62.6
2600	53.0	53.8	54.7	55.9	57.4	59.0	60.9	62.9	65.1	67.4
2800	57.0	57.8	58.8	60.1	61.6	63.3	65.3	67.4	69.8	72.3
3000	61.0	61.8	62.8	64.2	65.7	67.6	69.6	71.9	74.3	76.9

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

Driftdown Critical Fuel Reserves - .84M/320 KIAS Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
256	242	230	219	209	200	191	183	176	170	163
514	486	461	439	418	400	382	367	352	339	327
772	730	692	658	628	600	574	550	529	508	490
1032	975	924	879	837	800	765	733	704	678	653
1292	1220	1156	1099	1047	1000	956	917	880	846	815
1552	1466	1389	1319	1257	1200	1147	1100	1056	1015	977
1813	1712	1621	1540	1466	1400	1338	1283	1231	1184	1140
2074	1958	1854	1760	1676	1600	1530	1465	1407	1352	1302
2334	2203	2086	1981	1886	1800	1721	1648	1582	1521	1464
2595	2449	2319	2202	2096	2000	1912	1831	1757	1689	1626
2855	2695	2551	2422	2305	2200	2103	2014	1933	1858	1789
3115	2940	2783	2642	2515	2400	2294	2198	2109	2027	1951
3374	3185	3015	2862	2725	2600	2485	2381	2285	2196	2114
3633	3429	3246	3082	2934	2800	2677	2564	2461	2365	2277
3890	3672	3477	3302	3143	3000	2868	2748	2637	2535	2441

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)									
	180	200	220	240	260	280	300	320	340	360
200	5.1	5.3	5.4	5.6	5.8	6.0	6.2	6.3	6.5	6.8
400	8.7	9.0	9.3	9.6	10.0	10.4	10.8	11.2	11.8	12.4
600	12.3	12.7	13.1	13.5	14.0	14.6	15.3	15.9	16.7	17.6
800	15.8	16.3	16.8	17.4	18.0	18.8	19.7	20.6	21.6	22.7
1000	19.3	19.9	20.5	21.2	22.0	23.0	24.0	25.1	26.4	27.7
1200	22.8	23.5	24.2	25.0	25.9	27.1	28.3	29.6	31.1	32.7
1400	26.3	27.0	27.8	28.8	29.9	31.1	32.6	34.1	35.8	37.6
1600	29.8	30.6	31.5	32.5	33.7	35.2	36.8	38.5	40.5	42.5
1800	33.3	34.1	35.1	36.2	37.6	39.2	40.9	42.9	45.1	47.3
2000	36.7	37.6	38.7	39.9	41.4	43.2	45.1	47.2	49.6	52.1
2200	40.2	41.2	42.3	43.6	45.2	47.1	49.2	51.5	54.1	56.8
2400	43.6	44.7	45.8	47.3	49.0	51.0	53.3	55.8	58.5	61.4
2600	47.0	48.1	49.4	50.9	52.8	54.9	57.3	60.0	63.0	66.0
2800	50.5	51.6	53.0	54.6	56.5	58.8	61.3	64.2	67.3	70.6
3000	53.9	55.1	56.5	58.2	60.2	62.6	65.3	68.3	71.7	75.1

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
- Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
- Increase fuel required 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (12%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Intentionally
Blank

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200		1010	1100	1200	1240	1270	1310	1350
1400	1090	1170	1280	1400	1460	1500	1560	1620
1600	1230	1340	1460	1600	1670	1730	1810	1890
1800	1380	1500	1640	1800	1890	1960	2060	2150
2000	1520	1660	1820	2000	2100	2190	2300	2420
2200	1670	1830	2000	2200	2320	2420	2550	2680
2400	1810	1990	2180	2400	2530	2640	2800	2950
2600	1960	2150	2360	2600	2740	2870	3050	3220
2800	2110	2320	2540	2800	2960	3100	3300	3480
3000	2250	2480	2720	3000	3170	3330	3540	3750
3200	2400	2650	2900	3200	3390	3560	3790	4010
3400	2540	2810	3080	3400	3600	3790	4040	4280
3600	2690	2970	3260	3600	3820	4020	4290	4550
3800	2830	3140	3440	3800	4030	4250	4540	4810
4000	2980	3300	3620	4000	4250	4480	4780	5080
4200	3120	3460	3800	4200	4460	4710	5030	5350
4400	3270	3630	3980	4400	4680	4940	5280	5610
4600	3410	3790	4160	4600	4890	5170	5530	5880
4800	3560	3950	4340	4800	5110	5400	5780	
5000	3710	4120	4520	5000	5320	5630		

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	182.6	171.4	160.6	150.2	
1600	219.0	205.3	192.6	180.5	168.9
1800	257.1	241.2	225.9	211.4	197.8
2000	292.9	277.6	260.3	243.8	228.0
2200	309.3	301.3	292.8	276.6	258.8
2400	321.9	313.1	305.0	297.0	287.1
2600	334.6	324.5	315.2	307.0	298.8
2800	347.8	336.0	325.7	316.1	307.8
3000	361.9	348.0	336.2	325.8	316.0
3200	373.7	361.1	347.0	335.3	324.7
3400	385.1	371.8	359.1	344.2	333.4
3600		382.1	368.9	356.2	341.5
3800			378.2	365.1	352.3
4000			387.4	373.6	360.5
4200				381.9	368.3
4400					375.9
4600					383.5

With manual speedbrakes, decrease weight by 21700 kg.
With 1 brake deactivated, decrease weight by 22800 kg.
With 2 brakes deactivated, decrease weight by 46300 kg.

Landing Field Limit Weight - Wet Runway

Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200				1200	1240	1250	1280	1320
1400		1180	1280	1400	1450	1480	1530	1580
1600	1240	1340	1460	1600	1660	1710	1780	1850
1800	1390	1500	1640	1800	1880	1940	2030	2120
2000	1530	1670	1820	2000	2090	2170	2280	2380
2200	1680	1830	2000	2200	2310	2400	2520	2650
2400	1830	2000	2180	2400	2520	2630	2770	2910
2600	1970	2160	2360	2600	2740	2860	3020	3180
2800	2120	2320	2540	2800	2950	3090	3270	3450
3000	2260	2490	2720	3000	3170	3320	3520	3710
3200	2410	2650	2900	3200	3380	3550	3760	3980
3400	2550	2810	3080	3400	3600	3780	4010	4240
3600	2700	2980	3260	3600	3810	4000	4260	4510
3800	2840	3140	3440	3800	4030	4230	4510	4780
4000	2990	3300	3620	4000	4240	4460	4760	5040
4200	3130	3470	3800	4200	4450	4690	5000	5310
4400	3280	3630	3980	4400	4670	4920	5250	5580
4600	3430	3800	4160	4600	4880	5150	5500	5840
4800	3570	3960	4340	4800	5100	5380	5750	6110
5000	3720	4120	4520	5000	5310	5610	6000	6370

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	150.2				
1600	181.0	169.9	159.2		
1800	212.5	199.3	187.0	175.2	163.9
2000	245.5	230.2	215.6	201.8	189.0
2200	278.9	261.7	245.3	229.7	214.7
2400	300.6	291.9	275.4	258.0	241.3
2600	313.3	305.3	297.4	286.2	268.3
2800	324.1	315.0	306.9	298.8	289.4
3000	335.2	325.0	315.6	307.4	299.2
3200	346.4	335.1	324.8	315.3	307.0
3400	359.3	344.9	334.0	323.7	314.3
3600	369.7	357.2	342.6	332.0	321.7
3800	379.7	366.8	354.2	340.0	329.3
4000		375.9	363.0	349.6	336.6
4200		384.8	371.4	358.5	343.5
4400			379.4	366.3	353.4
4600			387.4	373.6	360.5
4800				380.8	367.3
5000				388.0	373.9
5200					380.5
5400					387.1

With manual speedbrakes, decrease weight by 21700 kg.
With 1 brake deactivated, decrease weight by 22800 kg.
With 2 brakes deactivated, decrease weight by 46300 kg.

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
(°C)	(°F)	-2000	0	2000	4000	6000	8000
54	129	304.9	284.8				
52	126	313.0	291.7				
50	122	321.0	299.0	274.7			
48	118	329.1	307.4	281.2			
46	115	337.3	315.9	288.2	265.3		
44	111	345.2	323.9	295.9	272.2		
42	108	352.5	332.1	304.6	278.8	255.6	
40	104	359.7	340.5	312.9	285.6	261.5	
38	100	366.9	349.0	320.7	292.2	267.2	237.5
36	97	373.4	356.3	327.9	298.5	272.1	242.3
34	93	378.7	363.3	335.4	304.7	276.5	247.0
32	90	378.7	370.4	341.7	310.6	280.5	251.3
30	86	378.7	376.6	347.1	317.1	284.8	255.1
28	82	378.7	376.7	351.7	322.0	289.4	258.9
26	79	378.7	376.8	357.1	325.9	294.0	262.5
24	75	378.7	376.9	357.2	329.0	298.9	266.5
22	72	378.7	377.0	357.3	332.2	302.2	270.7
20	68	378.7	377.1	357.3	332.3	304.3	274.3
18	64	378.7	377.2	357.4	332.4	306.4	276.8
16	61	378.7	377.3	357.5	332.4	306.4	278.6
14	57	378.7	377.3	357.6	332.5	306.5	280.1
12	54	378.7	377.4	357.7	332.6	306.5	280.2
10	50	378.7	377.4	357.7	332.7	306.6	280.3
8	46	378.7	377.5	357.8	332.7	306.6	280.3
6	43	378.7	377.5	357.8	332.8	306.6	280.2
4	40	378.7	377.5	354.6	320.5	293.0	258.9
2	36	378.7	377.6	354.6	320.5	293.0	258.9
0	32	378.7	377.6	354.7	320.6	293.0	259.0
-40	-40	378.7	377.7	354.6	320.6	293.0	259.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1350 kg.
With engine and wing anti-ice on, decrease weight by 2200 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 21950 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 20, Gear Up

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	6.24	5.26	4.08			
50	7.02	6.00	4.72	3.63	2.62	1.26
46	7.84	6.81	5.46	4.24	3.15	1.74
42	8.61	7.64	6.25	4.96	3.73	2.24
38	9.35	8.47	7.01	5.63	4.32	2.76
34	9.80	9.22	7.70	6.22	4.79	3.25
30	9.81	9.82	8.23	6.76	5.23	3.66
26	9.83	9.83	8.68	7.19	5.73	4.05
22	9.85	9.83	8.68	7.49	6.07	4.48
18	9.87	9.84	8.69	7.50	6.29	4.78
14	9.89	9.85	8.70	7.50	6.29	4.97
10	9.90	9.86	8.70	7.50	6.29	4.97

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)										
	0	1	2	3	4	5	6	7	8	9	10
360	-3.07	-3.51	-3.94	-4.39	-4.79	-5.22	-5.64	-6.06	-6.46	-6.88	-7.26
340	-2.79	-3.19	-3.58	-3.99	-4.35	-4.74	-5.12	-5.49	-5.86	-6.23	-6.58
320	-2.50	-2.85	-3.19	-3.55	-3.86	-4.21	-4.54	-4.87	-5.19	-5.52	-5.83
300	-2.16	-2.46	-2.74	-3.04	-3.30	-3.59	-3.87	-4.14	-4.41	-4.70	-4.96
280	-1.75	-1.98	-2.20	-2.43	-2.63	-2.86	-3.07	-3.29	-3.50	-3.72	-3.91
260	-1.23	-1.39	-1.54	-1.69	-1.82	-1.98	-2.12	-2.27	-2.41	-2.57	-2.71
240	-0.58	-0.65	-0.72	-0.79	-0.85	-0.92	-0.99	-1.05	-1.12	-1.19	-1.26
225	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220	0.23	0.26	0.28	0.30	0.32	0.35	0.37	0.39	0.42	0.45	0.47
200	1.18	1.32	1.47	1.61	1.74	1.89	2.02	2.17	2.32	2.47	2.61
180	2.19	2.51	2.83	3.11	3.43	3.74	4.04	4.36	4.70	5.03	5.32

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)										
	0	1	2	3	4	5	6	7	8	9	10
VREF	-0.22	-0.23	-0.23	-0.23	-0.23	-0.22	-0.22	-0.22	-0.21	-0.21	-0.21
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.08	0.07	0.07	0.07	0.09	0.11	0.12	0.11	0.12	0.10	0.10
VREF+20	0.17	0.14	0.12	0.13	0.16	0.19	0.19	0.17	0.17	0.14	0.13
VREF+30	0.14	0.10	0.08	0.08	0.10	0.05	0.03	0.01	-0.01	-0.07	-0.04

With engine bleed for packs off, increase gradient by 0.1%.
With engine and wing anti-ice on, decrease gradient by 0.1%.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease gradient by 0.7%

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	231.5				
50	122	233.0	224.3			
45	113	234.9	226.1	217.6		
40	104	236.8	227.9	219.4	210.9	
35	95	238.8	229.9	221.2	212.7	204.3
30	86	240.9	231.8	223.1	214.6	206.1
25	77	242.9	233.9	225.0	216.5	207.9
20	68	245.1	235.9	227.0	218.4	209.8
15	59	247.3	238.1	229.0	220.3	211.7
10	50	249.5	240.3	231.1	222.3	213.7
5	41	251.9	242.5	233.3	224.3	215.7
0	32	254.3	244.8	235.5	226.4	217.7
-5	23	256.7	247.1	237.8	228.6	219.8
-10	14	259.3	249.5	240.1	230.9	221.9
-15	5	261.9	252.1	242.5	233.2	224.1
-20	-4	264.6	254.7	245.0	235.6	226.4
-30	-22	270.2	260.1	250.2	240.6	231.2
-40	-40	275.9	265.8	255.7	245.9	236.3
-50	-58	282.1	271.9	261.6	251.5	241.7
-54	-65	284.7	274.3	264.1	253.9	243.9

Increase weight by 2150 kg per 1% uphill slope. Decrease weight by 3450 kg per 1% downhill slope. Increase weight by 5950 kg per 10 knots headwind. Decrease weight by 31550 kg per 10 knots tailwind.

Decrease weight by 12500 kg when one brake is deactivated. Decrease weight by 25450 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

Intentionally
Blank

GEAR DOWN

Takeoff Climb Limit Weight

Flaps 15

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	234.8	224.0	208.0	187.2	
52	126	240.2	223.9	213.9	192.6	
50	122	246.0	225.1	214.8	198.0	171.1
48	118	252.0	230.7	214.7	203.1	176.2
46	115	257.9	236.2	215.8	203.6	181.3
44	111	263.7	241.5	220.8	203.5	186.2
42	108	269.2	246.8	225.7	204.6	188.9
40	104	274.8	252.3	230.8	209.2	188.8
38	100	281.0	258.1	236.2	214.0	189.9
36	97	287.2	263.9	241.7	219.1	194.3
34	93	293.5	269.8	247.3	224.4	198.8
32	90	299.1	275.6	252.8	229.5	203.6
30	86	304.4	281.7	258.4	234.9	208.6
28	82	309.8	287.7	264.1	240.1	213.4
26	79	314.6	293.2	269.3	245.3	218.5
24	75	317.0	298.0	274.1	250.1	223.3
22	72	317.1	302.3	278.5	254.3	228.4
20	68	317.2	304.4	282.3	257.8	232.9
18	65	317.3	304.4	285.8	260.9	236.5
16	61	317.4	304.4	287.5	263.2	239.6
14	58	317.4	304.4	287.5	265.2	242.3
10	50	317.5	304.5	287.4	266.0	245.1
-40	-40	315.7	302.5	284.4	262.7	242.7

With engine bleed for packs off, increase weight by 800 kg.
With engine anti-ice on, decrease weight by 1800 kg.
With engine and wing anti-ice on, decrease weight by 4200 kg.

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
(°C)	(°F)	0	2000	4000	6000	8000
54	129	256.3				
52	126	262.6				
50	122	268.8	247.1			
48	118	275.6	253.2			
46	115	282.7	259.8	239.0		
44	111	289.4	266.9	245.5		
42	108	296.4	273.8	251.4	230.2	
40	104	303.7	280.5	257.6	235.4	
38	100	310.6	286.2	263.3	240.7	213.4
36	97	317.2	292.0	268.4	244.9	217.7
34	93	323.8	298.1	273.0	248.8	222.1
32	90	329.9	303.4	277.6	252.3	225.8
30	86	335.7	308.2	282.4	256.2	229.3
28	82	335.8	312.3	286.6	260.3	232.6
26	79	335.9	316.9	289.9	264.7	235.9
24	75	336.0	316.9	292.3	268.5	239.6
22	72	336.1	317.0	294.9	271.0	243.4
20	68	336.1	317.1	294.9	272.6	246.7
18	64	336.2	317.2	295.0	274.2	248.9
16	61	336.3	317.2	295.0	274.3	250.5
14	57	336.4	317.3	295.1	274.3	251.9
12	54	336.4	317.4	295.1	274.3	252.0
10	50	336.5	317.4	295.1	274.3	252.0
-40	-40	336.7	317.7	295.5	274.6	252.2

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight by 1750 kg.
With engine and wing anti-ice on, decrease weight by 1700 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 30650 kg.

GEAR DOWN

Takeoff Obstacle Limit Weight

Flaps 15

Sea Level, 30°C & Below, Zero Wind

Based on engine bleed for packs on, engine and wing anti-ice off

OBSTACLE HEIGHT (M)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	293.7										
20	272.9	294.4									
40	253.0	274.0	290.2	302.7							
60	237.9	258.1	274.5	287.6	298.0						
80	225.5	245.1	261.4	274.8	285.7	294.7	302.2				
100	214.9	234.1	250.1	263.6	274.9	284.3	292.2	298.9	304.6	308.3	309.4
120	205.6	224.4	240.3	253.7	265.2	274.9	283.2	290.2	296.3	301.6	306.1
140	197.5	215.8	231.5	244.9	256.4	266.3	274.8	282.2	288.6	294.1	299.1
160	190.2	208.1	223.6	236.9	248.4	258.4	267.1	274.7	281.4	287.2	292.3
180	183.5	201.1	216.4	229.7	241.1	251.2	260.0	267.8	274.6	280.6	286.0
200	177.3	194.8	209.7	222.9	234.4	244.5	253.4	261.2	268.2	274.4	280.0
220	171.7	188.9	203.6	216.7	228.2	238.2	247.2	255.1	262.2	268.6	274.3
240		183.4	198.0	210.9	222.3	232.4	241.4	249.4	256.6	263.0	268.8
260		178.2	192.8	205.4	216.8	226.9	235.9	244.0	251.2	257.7	263.7
280		173.4	187.8	200.4	211.6	221.7	230.7	238.8	246.1	252.7	258.7
300		168.9	183.1	195.6	206.7	216.8	225.8	233.9	241.3	247.9	254.0

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
30 & BELOW	0	0	0	0	0	0	0	0
32	-2.8	-3.2	-3.6	-4.1	-4.5	-4.9	-5.3	-5.7
34	-5.6	-6.5	-7.3	-8.1	-8.9	-9.7	-10.6	-11.4
36	-8.5	-9.7	-10.9	-12.2	-13.4	-14.6	-15.8	-17.1
38	-11.3	-12.9	-14.6	-16.2	-17.8	-19.5	-21.1	-22.8
40	-14.1	-16.2	-18.2	-20.3	-22.3	-24.4	-26.4	-28.4
42	-16.8	-19.3	-21.8	-24.3	-26.8	-29.2	-31.7	-34.2
44	-19.6	-22.5	-25.4	-28.3	-31.2	-34.1	-37.0	-40.0
46	-22.3	-25.6	-29.0	-32.3	-35.7	-39.0	-42.4	-45.7
48	-25.0	-28.8	-32.6	-36.3	-40.1	-43.9	-47.7	-51.5
50	-27.7	-31.9	-36.1	-40.4	-44.6	-48.8	-53.0	-57.2

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-6.9	-7.5	-8.2	-8.9	-9.6	-10.3	-11.0	-11.7
2000	-13.7	-15.1	-16.5	-17.9	-19.3	-20.7	-22.1	-23.5
3000	-19.5	-21.7	-23.8	-26.0	-28.1	-30.3	-32.4	-34.6
4000	-25.3	-28.2	-31.1	-34.0	-36.9	-39.8	-42.7	-45.6
5000	-32.3	-35.9	-39.6	-43.2	-46.9	-50.5	-54.1	-57.8
6000	-39.3	-43.7	-48.0	-52.4	-56.8	-61.2	-65.5	-69.9
7000	-45.7	-50.9	-56.0	-61.2	-66.4	-71.5	-76.7	-81.8
8000	-52.2	-58.1	-64.1	-70.0	-75.9	-81.8	-87.8	-93.7

GEAR DOWN

Takeoff Obstacle Limit Weight
Flaps 15
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	160	180	200	220	240	260	280	300
15 TW	-18.3	-20.0	-21.7	-23.3	-25.0	-26.7	-28.3	-30.0
10 TW	-12.2	-13.3	-14.4	-15.6	-16.7	-17.8	-18.9	-20.0
5 TW	-6.1	-6.7	-7.2	-7.8	-8.3	-8.9	-9.4	-10.0
0	0	0	0	0	0	0	0	0
10 HW	3.5	3.3	3.2	3.0	2.8	2.7	2.5	2.3
20 HW	7.0	6.7	6.3	6.0	5.7	5.3	5.0	4.7
30 HW	11.5	10.8	10.2	9.5	8.8	8.2	7.5	6.8
40 HW	16.0	15.0	14.0	13.0	12.0	11.0	10.0	9.0

With engine bleed for packs off, increase weight by 950 kg.
With engine anti-ice on, decrease weight by 1600 kg.
With engine and wing anti-ice on, decrease weight by 3950 kg.

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18200	16100	13700
350	18800	16900	14400
340	19400	17600	15100
330	20000	18200	15800
320	20700	19100	16800
310	21800	20300	18000
300	22800	21400	19300
290	24000	22500	20600
280	25100	23700	22000
270	26200	24800	23300
260	27300	26100	24600
250	28500	27500	26000
240	29700	28900	27400
230	30600	30200	28900
220	31400	31100	30300
210	32300	32000	31400
200	33200	33000	32500
190	34100	34000	33700
180	35000	34900	34800
170	36000	36000	35800
160	37000	37000	36800

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
334	296	264	239	218	200	187	175	165	156	149
500	444	396	358	327	300	281	264	249	235	224
666	591	527	477	436	400	375	352	332	314	299
830	738	659	596	545	500	469	441	416	393	374
993	883	789	714	653	600	563	530	500	473	450
1156	1029	920	833	762	700	657	618	583	552	525
1318	1173	1050	951	870	800	751	707	667	632	601
1479	1318	1179	1069	979	900	845	796	751	712	677
1639	1462	1309	1187	1087	1000	939	884	835	791	753
1799	1605	1438	1305	1196	1100	1033	973	919	871	829
1958	1748	1567	1423	1304	1200	1128	1062	1003	951	905
2116	1890	1696	1540	1412	1300	1222	1151	1087	1030	981
2273	2032	1824	1658	1520	1400	1316	1240	1171	1110	1058
2430	2174	1952	1775	1628	1500	1410	1329	1255	1191	1134
2586	2315	2080	1892	1736	1600	1504	1418	1340	1271	1211
2741	2455	2208	2009	1844	1700	1599	1507	1425	1351	1287
2896	2595	2335	2125	1952	1800	1693	1596	1509	1432	1364
3050	2734	2461	2242	2060	1900	1788	1686	1594	1512	1441
3203	2873	2588	2358	2167	2000	1882	1776	1679	1593	1518

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.7	0:52	7.4	0:50	7.2	0:48	7.1	0:46	7.0	0:45
300	11.4	1:16	10.8	1:12	10.4	1:09	10.1	1:06	9.9	1:03
400	15.0	1:40	14.2	1:35	13.6	1:30	13.1	1:26	12.8	1:22
500	18.6	2:03	17.6	1:57	16.8	1:51	16.1	1:46	15.6	1:41
600	22.3	2:26	21.1	2:19	20.1	2:12	19.3	2:05	18.6	1:59
700	26.0	2:49	24.6	2:41	23.4	2:32	22.4	2:24	21.6	2:17
800	29.8	3:12	28.1	3:02	26.8	2:53	25.5	2:44	24.6	2:35
900	33.5	3:35	31.6	3:24	30.1	3:13	28.7	3:03	27.6	2:53
1000	37.3	3:58	35.1	3:46	33.4	3:34	31.8	3:22	30.6	3:11
1100	41.2	4:20	38.8	4:07	36.9	3:54	35.1	3:41	33.8	3:29
1200	45.1	4:42	42.5	4:28	40.3	4:13	38.4	4:00	37.0	3:47
1300	49.0	5:05	46.2	4:49	43.8	4:33	41.7	4:18	40.1	4:04
1400	53.0	5:27	49.8	5:10	47.3	4:53	45.0	4:37	43.3	4:22
1500	56.9	5:49	53.5	5:31	50.7	5:13	48.2	4:56	46.4	4:39
1600	61.0	6:10	57.4	5:51	54.3	5:32	51.7	5:14	49.8	4:56
1700	65.1	6:31	61.2	6:11	58.0	5:51	55.1	5:32	53.1	5:13
1800	69.2	6:53	65.1	6:31	61.6	6:10	58.6	5:50	56.4	5:30
1900	73.3	7:14	68.9	6:52	65.2	6:30	62.1	6:08	59.8	5:48
2000	77.4	7:35	72.8	7:12	68.8	6:49	65.5	6:26	63.1	6:05

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)					
	160	180	200	220	240	260
5	-0.5	-0.3	0.0	0.3	0.7	1.0
10	-1.0	-0.5	0.0	0.6	1.3	2.0
15	-1.6	-0.8	0.0	1.0	2.0	3.0
20	-2.1	-1.1	0.0	1.3	2.6	4.0
25	-2.6	-1.3	0.0	1.6	3.3	5.0
30	-3.2	-1.6	0.0	2.0	4.0	6.1
35	-3.7	-1.9	0.0	2.3	4.6	7.1
40	-4.2	-2.2	0.0	2.6	5.3	8.2
45	-4.8	-2.4	0.0	3.0	6.0	9.3
50	-5.3	-2.7	0.0	3.3	6.7	10.4
55	-5.8	-3.0	0.0	3.6	7.5	11.5
60	-6.4	-3.2	0.0	4.0	8.2	12.7
65	-6.9	-3.5	0.0	4.3	8.9	13.8
70	-7.5	-3.8	0.0	4.7	9.7	15.0
75	-8.0	-4.0	0.0	5.0	10.4	16.2
80	-8.5	-4.3	0.0	5.4	11.2	17.4

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN

Short Trip Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
105	86	73	63	56	50	45	41	38	35	33
174	152	134	120	109	100	92	85	80	75	70
245	217	195	177	163	150	139	130	122	115	108
314	282	256	234	216	200	186	175	164	155	147
384	347	316	290	269	250	234	219	207	196	185
452	411	376	347	322	300	281	264	250	236	224
521	474	436	403	375	350	328	309	292	277	264
590	539	496	459	428	400	376	354	335	318	303
659	603	556	515	480	450	423	399	378	359	342
730	668	616	572	534	500	470	444	421	399	380

Trip Fuel and Time

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)						TIME (HRS:MIN)
		160	180	200	220	240	260	
50	FUEL (1000 KG)	2.2	2.3	2.5	2.6	2.8	2.9	0:16
	ALT (FT)	11000	11000	11000	11000	9000	9000	
100	FUEL (1000 KG)	3.6	3.8	4.1	4.3	4.6	4.9	0:26
	ALT (FT)	21000	21000	19000	19000	17000	17000	
150	FUEL (1000 KG)	4.8	5.2	5.6	5.9	6.3	6.7	0:35
	ALT (FT)	27000	27000	25000	23000	23000	21000	
200	FUEL (1000 KG)	6.0	6.5	7.0	7.5	8.0	8.5	0:44
	ALT (FT)	33000	31000	27000	27000	25000	23000	
250	FUEL (1000 KG)	7.2	7.8	8.4	9.0	9.6	10.2	0:52
	ALT (FT)	33000	31000	29000	27000	25000	23000	
300	FUEL (1000 KG)	8.3	9.0	9.8	10.5	11.3	12.0	1:01
	ALT (FT)	33000	33000	29000	27000	25000	25000	
350	FUEL (1000 KG)	9.5	10.3	11.1	12.0	12.9	13.8	1:09
	ALT (FT)	33000	33000	31000	29000	27000	25000	
400	FUEL (1000 KG)	10.7	11.6	12.5	13.5	14.6	15.6	1:17
	ALT (FT)	33000	33000	31000	29000	27000	25000	
450	FUEL (1000 KG)	11.9	12.9	13.9	15.1	16.2	17.4	1:26
	ALT (FT)	33000	33000	31000	29000	27000	25000	
500	FUEL (1000 KG)	13.0	14.1	15.4	16.6	17.9	19.2	1:34
	ALT (FT)	33000	33000	31000	29000	27000	25000	

GEAR DOWN

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
360	15590						
340	14930	14940					
320	14020	14000					
300	13010	12990	12950				
280	12150	12140	12080				
260	11360	11350	11280	11340			
240	10600	10580	10500	10530	10640		
220	9880	9830	9750	9760	9860		
200	9160	9090	9000	8990	9070	9190	
180	8460	8370	8270	8260	8300	8370	8580
160	7760	7670	7540	7530	7530	7580	7740

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	15290	15370	15350	15590	16370
340	14580	14620	14600	14800	15370
320	13630	13650	13640	13760	14190
300	12620	12620	12600	12720	12980
280	11740	11740	11700	11810	12030
260	10930	10910	10860	10970	11100
240	10140	10100	10030	10110	10220
220	9380	9310	9240	9280	9380
200	8620	8530	8440	8460	8540
180	7880	7780	7670	7660	7710
160	7150	7050	6920	6870	6910

These tables include 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
20	169.8	169.8	
18	180.3	178.3	174.3
16	192.5	190.8	186.9
14	205.6	204.8	199.7
12	221.7	219.6	213.0
10	237.9	235.2	228.3
8	254.9	251.1	244.7
6	274.1	267.1	257.3
4	290.9	280.1	267.4
2	304.5	291.6	278.0
0	316.7	302.3	287.7

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)									
	PRESSURE ALTITUDE (1000 FT)									
	0	2	4	6	8	10	12	14	16	18
ENGINE ONLY	0.0	-0.6	-1.0	-1.1	-1.0	-0.8	-0.7	-0.1	0.0	0.0
ENGINE AND WING	-2.2	-2.9	-2.9	-3.0	-2.6	-2.3	-1.9	-1.5	-1.2	-1.0

Intentionally
Blank

Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire Speed, and Obstacle Limit Weights as determined from the following tables. Brake Energy Limit is not shown as it is not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

Field Limit Weight - Slope and Wind Corrections

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction table with slope corrected field length and wind component to determine the slope and wind corrected field length.

Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and runway condition and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude and runway condition with “Slope and Wind Corrected Field Length” determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

When finding a maximum weight for a wet runway, the dry runway limit weight must also be determined and the lower of the two weights used.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

Tire Speed Limit

Maximum tire speed limited weights are presented for 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from either the wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3800 kg for a dry runway or 2250 kg for a wet runway and the V1 associated with the reduced weight by 2 knots. With two brakes deactivated, reduce the normal runway limited weight by 7700 kg for a dry runway or 4700 kg for a wet runway and the V1 associated with the reduced weight by 5 knots for a dry runway or 3 knots for a wet runway. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 1500 m for one brake deactivated or 1550 m for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 1900 m for one brake deactivated or 1950 m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 5350 kg and the V1 associated with the reduced weight by 3 knots.

If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance available corrected for wind and slope exceeds approximately 1950 m.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability at two center of gravity positions: 7.5% MAC (FMC default) for use when no center of gravity is entered on the PERF INIT page, and 30% MAC (typical mid cruise center of gravity) for use when 30% MAC is entered. Crews may interpolate between these values to determine the airplane's capability at other specific center of gravity positions. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time Table with air distance from the Ground to Air Miles Conversion Table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment Table with the Reference Fuel and the planned landing weight to obtain fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Oxygen Requirements

Passenger Oxygen System - Gaseous

Data is provided to determine minimum oxygen cylinder pressure dispatch requirements. Table 1 shows oxygen quantity required to complete the direct emergency descent to 10,000 ft. Table 2 shows oxygen quantity required per minute for the number of passenger cabin occupants at various level off intermediate altitude above 10,000 ft. The minimum oxygen quantity required for a particular flight is obtained from Table 1 by intersecting the number of passenger occupants and the initial cruise altitude to obtain the oxygen quantity in liters. If the flight is planned to level off the cruise at the intermediate altitude after descent from the initial altitude, the total oxygen quantity required is obtained by summation of

Table 1, the oxygen requirement for the direct descent to 10,000 ft, plus values from Table 2 multiplied by the time duration at the level off intermediate altitude.

After determining the total volume (in liters) required from Tables 1 and 2, the liters to pressure conversion table is used to establish the minimum dispatch pressure for the particular cylinder configuration installed in the airplane. Temperature corrections for non-reference conditions are given must be used to adjust the required dispatch pressure at 21°C (70°F) to final flight dispatch value.

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck.

Tables are provided to determine the flight crew oxygen dispatch requirements. Table 1 shows minimum oxygen quantity necessary to ensure that protective breathing requirements are satisfied. Table 2 shows the supplemental oxygen requirement for loss of pressurization, emergency descent and total post decompression flight time above 10000 ft. Table 3 gives adjustments that must be applied to Table 2 crew member supplemental requirements in situations where the enroute altitude after decompression will exceed 14000 ft. The increments shown in Table 3 reflect only the increase in oxygen flow rate associated with periods of post decompression flight at altitudes other than 14000 ft. Hence, this time must also be included in the Table 2 time value used.

Table 1, Table 2 and Table 3 values are based on “NORMAL” regulator settings. Table 3 also shows “100%” regulator setting adjustments that can be used if the operator chooses to schedule oxygen dispatch requirements based on pure oxygen availability.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (0.6 psi/person/minute for the dual cylinder system) or 13 liters/person/minute (4 psi/person/minute) if 100% oxygen is selected during normal usage.

After determining the total volume (liters) required for the flight crew by using the larger value from Table 1 or Table 2, obtain the dispatch pressure required from the Cylinder Volume to Pressure Conversion table (Table 4). Adjust this reading for cylinder temperature as required, using the adjustments given (Table 5).

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for in-service deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 30.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-around Gradient table with airport OAT and pressure altitude to determine the reference Go-Around Gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted Go-Around Gradient. Apply the necessary engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

Gear Down

This section provides flight planning data for revenue operation with gear down.

Takeoff/Landing Climb Limit Weight

Enter table with airport OAT and pressure altitude to determine Takeoff Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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777-200ER TRENT884 KG FAA

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Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	160
2000	220
2500	260
3000	310
3500	350
4000	400
4500	440

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)			
	100	120	140	160
300	-3	-3	-3	-3
200	-3	-3	-3	-2
100	-1	-1	-1	-1
0	0	0	0	0
-100	3	2	1	1
-200	5	4	3	3
-300	6	4	4	4

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
300	166	174	180
290	164	171	177
280	161	168	174
270	157	165	171
260	154	162	168
250	151	159	164
240	148	156	161
230	145	152	158
220	142	149	154
210	139	145	150
200	135	142	147
190	132	138	143
180	128	134	139
170	124	131	135
160	121	127	131
150	117	123	127
140	113	118	123

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

Dry Snow Conversion Table

Dry Snow Depth (mm)	Equivalent Slush/Standing Water Depth (mm)
20	2.50
40	5.00
60	7.50
80	10.00
100	12.50

For dry snow, enter the Slush/Standing Water table with the equivalent depth shown in the table above.

ADVISORY INFORMATION

Slush/Standing Water Takeoff
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-31.8	-36.4	-40.9	-40.3	-44.8	-49.4	-53.8	-58.3	-62.9
300	-30.1	-34.6	-39.2	-37.4	-41.9	-46.5	-48.9	-53.5	-58.0
280	-28.1	-32.6	-37.2	-34.3	-38.8	-43.3	-44.0	-48.5	-53.1
260	-25.8	-30.4	-34.9	-30.9	-35.5	-40.0	-38.9	-43.5	-48.0
240	-23.2	-27.8	-32.3	-27.4	-31.9	-36.5	-33.8	-38.4	-42.9
220	-20.4	-24.9	-29.5	-23.6	-28.2	-32.7	-28.6	-33.1	-37.7
200	-17.3	-21.8	-26.3	-19.6	-24.2	-28.7	-23.3	-27.9	-32.4
180	-13.8	-18.4	-22.9	-15.5	-20.0	-24.5	-17.9	-22.5	-27.0
160	-10.1	-14.7	-19.2	-11.1	-15.6	-20.1	-12.5	-17.0	-21.6
140	-6.3	-10.8	-15.4	-6.6	-11.1	-15.6	-7.0	-11.5	-16.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800				104.4			126.0		
2000	126.6			143.5			164.6	112.9	
2200	165.8	113.3		182.8	130.2		204.0	151.4	
2400	206.2	152.4		223.7	169.2	116.8	245.0	190.4	138.3
2600	248.8	192.1	139.1	266.8	209.5	155.9	287.8	230.8	177.0
2800	294.2	234.0	178.4	312.2	251.8	195.6	332.5	273.0	216.9
3000	342.3	278.4	219.5	359.2	296.4	237.2	377.5	317.1	258.4
3200		325.8	262.9		343.2	280.9		362.2	301.8
3400		374.2	309.3			327.2			346.8
3600			357.7			374.2			

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.**
2. **Adjust field length available by -52 m/+52 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-18	-16	-14	-12	-10	-8	-3	-1	1
300	-19	-17	-15	-12	-10	-8	-3	-1	1
280	-20	-18	-16	-13	-11	-9	-3	-1	1
260	-22	-20	-18	-15	-13	-11	-5	-3	-1
240	-23	-21	-19	-18	-16	-14	-8	-6	-4
220	-25	-23	-21	-20	-18	-16	-12	-10	-8
200	-26	-24	-22	-22	-20	-18	-15	-13	-11
180	-26	-24	-22	-23	-21	-19	-18	-16	-14
160	-25	-23	-21	-23	-21	-19	-19	-17	-15
140	-25	-23	-21	-22	-20	-18	-19	-17	-15

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Slippery Runway Takeoff

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLES LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.1	-2.2	-14.5	-15.6	-16.7	-31.3	-32.3	-33.4
300	0.0	-1.1	-2.2	-16.2	-17.2	-18.3	-31.4	-32.5	-33.5
280	-0.5	-1.6	-2.6	-17.2	-18.2	-19.3	-30.9	-32.0	-33.1
260	-2.1	-3.2	-4.3	-17.5	-18.6	-19.7	-29.8	-30.9	-32.0
240	-3.1	-4.2	-5.3	-17.2	-18.3	-19.3	-28.1	-29.2	-30.3
220	-3.7	-4.8	-5.8	-16.2	-17.3	-18.3	-25.8	-26.8	-27.9
200	-3.6	-4.7	-5.8	-14.5	-15.6	-16.7	-22.8	-23.9	-25.0
180	-3.1	-4.2	-5.2	-12.2	-13.3	-14.4	-19.3	-20.4	-21.5
160	-1.9	-3.0	-4.1	-9.2	-10.3	-11.4	-15.1	-16.2	-17.3
140	-0.6	-1.7	-2.8	-5.9	-7.0	-8.1	-10.7	-11.8	-12.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	126.8								
1600	204.4	147.8							
1800	278.5	224.7	168.8	114.1					
2000	349.6	297.8	244.6	167.8	112.1				
2200		368.5	316.9	223.1	165.9	110.2			
2400				281.2	221.1	163.9	131.3		
2600				342.1	279.0	219.0	165.1	113.6	
2800					339.9	276.9	200.1	147.4	
3000						337.7	237.3	181.5	129.7
3200							277.2	217.5	163.5
3400							320.5	255.9	198.4
3600							365.4	297.4	235.4
3800								341.9	275.2
4000									318.4

1. Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -25 m/+25 m for every 5°C above/below 4°C.
Adjust “Medium” field length available by -36 m/+36 m for every 5°C above/below 4°C.
Adjust “Poor” field length available by -50 m/+50 m for every 5°C above/below 4°C.
3. Find V1(MCG) limited weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-4	-2	0	-12	-10	-8	-23	-21	-19
300	-4	-2	0	-13	-11	-9	-25	-23	-21
280	-5	-3	-1	-15	-13	-11	-27	-25	-23
260	-7	-5	-3	-17	-15	-13	-30	-28	-26
240	-8	-6	-4	-19	-17	-15	-33	-31	-29
220	-9	-7	-5	-22	-20	-18	-36	-34	-32
200	-11	-9	-7	-23	-21	-19	-39	-37	-35
180	-12	-10	-8	-25	-23	-21	-41	-39	-37
160	-12	-10	-8	-26	-24	-22	-42	-40	-38
140	-13	-11	-9	-26	-24	-22	-43	-41	-39

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

Takeoff Speeds

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
300	166	171	175	159	163	168			
290	163	168	172	156	160	165	153	155	160
280	160	164	169	153	157	162	149	152	158
270	156	161	166	150	154	160	145	149	155
260	153	158	164	146	151	157	142	146	152
250	149	154	161	143	147	154	138	142	150
240	145	151	158	139	144	151	135	139	147
230	142	147	155	135	140	148	131	136	144
220	138	143	151	132	137	145	128	132	141
210	134	140	148	128	133	142	124	129	138
200	130	136	145	124	129	139	120	125	135
190	125	132	142	119	126	136	115	121	132
180	120	128	138	114	122	133	111	118	129
170	115	123	135	109	118	129	106	114	126
160	109	119	131	104	113	126	101	110	122
150	104	114	127	99	109	122	96	105	119
140	99	110	123	94	104	119	91	101	115

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	9	11	13			3	4	5	6			-2	-2	-3	-3		
50	122	4	6	8	10	11	13	2	3	4	5	5	6	-1	-1	-2	-2	-3	-3
40	104	1	3	5	7	9	11	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	2	4	6	8	0	0	1	2	3	4	0	0	-1	-1	-2	-2
20	68	0	0	1	2	5	7	0	0	1	1	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	2	4	6	0	0	1	1	2	3	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
300	-5	-2	0	2	4	-2	-1	-1	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
180	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
140	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2

Clearway and Stopway V1 Adjustments*

NORMAL V1 (KIAS)	CLEARWAY MINUS STOPWAY (M)						
	300	200	100	0	-100	-200	-300
100	-3	-3	-1	0	3	5	6
120	-3	-3	-1	0	2	4	4
140	-3	-3	-1	0	1	3	4
160	-3	-2	-1	0	1	3	4

***V1 not to exceed VR**

Takeoff Speeds

Max Allowable Clearway for V1 Adjustment

FIELD LENGTH (M)	1500	2000	2500	3000	3500	4000	4500
MAX ALLOWABLE CLEARWAY (M)	80	110	130	150	170	200	220

ADVISORY INFORMATION

TO1 - Slush/Standing Water Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-32.1	-36.2	-40.3	-38.6	-42.7	-46.8	-52.9	-57.0	-61.2
300	-30.3	-34.5	-38.6	-36.0	-40.1	-44.3	-48.4	-52.5	-56.7
280	-28.6	-32.7	-36.9	-33.4	-37.6	-41.8	-43.8	-48.0	-52.2
260	-26.5	-30.7	-34.9	-30.6	-34.8	-39.0	-39.2	-43.4	-47.7
240	-24.1	-28.4	-32.6	-27.4	-31.7	-35.9	-34.4	-38.7	-42.9
220	-21.4	-25.7	-29.9	-24.0	-28.3	-32.6	-29.5	-33.8	-38.1
200	-18.4	-22.7	-27.0	-20.4	-24.6	-28.9	-24.5	-28.8	-33.1
180	-15.0	-19.4	-23.7	-16.4	-20.7	-25.1	-19.3	-23.6	-28.0
160	-11.4	-15.7	-20.0	-12.2	-16.6	-20.9	-14.0	-18.3	-22.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800							147.5		
2000	156.5			168.9			190.0		
2200	200.1	141.9		212.9	154.3		234.2	175.4	
2400	246.2	185.0		259.3	197.7		280.4	218.9	161.0
2600	295.3	230.2	170.2	308.6	243.3	182.7	329.0	264.5	203.9
2800		278.2	214.5		291.5	227.5		312.2	248.7
3000		329.7	261.5			274.8			295.7
3200			311.8			325.0			

1. **Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -52 m/+52 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
280	-15	-13	-11	-10	-7	-5	1	4	6
260	-17	-15	-12	-12	-10	-7	-1	1	4
240	-19	-17	-14	-14	-12	-10	-4	-2	0
220	-21	-18	-16	-17	-15	-12	-8	-6	-4
200	-22	-20	-18	-19	-17	-15	-12	-10	-8
180	-22	-20	-18	-20	-18	-16	-15	-13	-10
160	-22	-20	-18	-20	-18	-16	-16	-14	-11
140	-21	-19	-17	-20	-17	-15	-16	-14	-12

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 - Slippery Runway Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-0.6	-1.6	-11.3	-12.3	-13.3	-28.2	-29.2	-30.2
300	0.0	-0.7	-1.7	-13.3	-14.3	-15.3	-28.7	-29.7	-30.7
280	0.0	-0.7	-1.7	-15.0	-16.0	-17.0	-28.9	-29.9	-30.9
260	-0.7	-1.7	-2.7	-16.0	-17.0	-18.0	-28.5	-29.5	-30.5
240	-2.2	-3.2	-4.2	-16.2	-17.2	-18.3	-27.3	-28.4	-29.4
220	-3.1	-4.1	-5.1	-15.7	-16.8	-17.8	-25.5	-26.6	-27.6
200	-3.4	-4.4	-5.5	-14.5	-15.6	-16.6	-23.1	-24.1	-25.2
180	-3.1	-4.2	-5.2	-12.6	-13.7	-14.7	-20.0	-21.0	-22.0
160	-2.3	-3.3	-4.4	-10.0	-11.1	-12.1	-16.2	-17.2	-18.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	155.2								
1600	235.2	176.4							
1800	311.2	255.3	197.3	138.6					
2000		330.4	275.1	195.4	136.3				
2200			349.6	255.0	193.1	134.1			
2400				318.0	252.5	190.8	151.8		
2600					315.4	250.1	188.0	133.3	
2800						312.8	226.4	168.9	
3000							267.8	206.1	150.4
3200							312.9	245.9	186.5
3400								288.9	224.8
3600								335.8	266.1
3800									311.0
4000									358.7

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -25 m/+25 m for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -36 m/+36 m for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -50 m/+50 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO1 - Slippery Runway Takeoff
8% Thrust Reduction
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
280	-5	-3	-2	-13	-11	-10	-24	-22	-20
260	-6	-4	-3	-15	-13	-11	-27	-25	-23
240	-7	-6	-4	-17	-15	-13	-30	-28	-26
220	-8	-7	-5	-19	-17	-15	-33	-31	-29
200	-9	-8	-6	-21	-19	-17	-35	-33	-31
180	-10	-9	-7	-22	-20	-18	-37	-35	-33
160	-11	-9	-7	-23	-21	-19	-38	-37	-35
140	-11	-9	-8	-23	-21	-19	-39	-37	-36

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

TO1 Takeoff Speeds
8% Thrust Reduction
V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
280	163	165	169						
270	159	162	166	152	155	159			
260	156	159	163	149	152	156	144	147	152
250	152	155	160	146	148	153	141	144	149
240	149	152	157	142	145	150	138	140	146
230	145	148	154	138	142	148	134	137	143
220	141	145	151	135	138	145	131	134	140
210	137	141	148	131	134	142	127	130	137
200	133	137	144	126	131	138	122	126	134
190	128	133	141	122	127	135	118	123	131
180	123	129	138	118	123	132	114	119	128
170	118	125	134	113	119	128	109	115	125
160	113	120	130	107	115	125	104	111	121
150	107	116	127	102	110	121	98	107	118
140	102	111	122	97	106	118	93	102	114

Check V1(MCG) in shared area.

V1, VR, V2 Adjustments*

TEMP		V1 PRESSURE ALT (1000 FT)						VR PRESSURE ALT (1000 FT)						V2 PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	9	11	12			3	4	5	6			-2	-2	-2	-3		
50	122	3	5	7	9	11	13	2	3	3	4	5	6	-1	-1	-2	-2	-2	-3
40	104	1	2	4	6	8	10	1	1	2	3	4	5	0	-1	-1	-1	-2	-2
30	86	0	0	2	4	6	8	0	0	1	2	3	4	0	0	0	-1	-1	-2
20	68	0	0	1	2	5	7	0	0	1	1	2	3	0	0	0	-1	-1	-1
-60	-76	0	0	1	2	4	5	0	0	1	1	2	3	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
280	-4	-1	0	2	2	-1	-1	0	0	0	1	1	2
260	-3	-1	0	2	2	-1	-1	0	0	0	1	1	2
220	-3	-1	0	2	2	-1	-1	0	0	0	1	1	2
200	-3	-1	0	2	2	-1	-1	0	0	0	1	1	2
180	-2	-1	0	2	3	-1	-1	0	0	1	1	2	2
160	-2	-1	0	2	3	-1	-1	0	0	1	1	2	2
140	-2	-1	0	2	3	-1	-1	0	0	1	2	2	3

ADVISORY INFORMATION

TO2 - Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-31.8	-35.5	-39.1	-38.8	-42.5	-46.2	-54.2	-57.9	-61.6
300	-29.9	-33.5	-37.2	-36.0	-39.7	-43.4	-49.6	-53.3	-57.0
280	-28.1	-31.8	-35.5	-33.4	-37.1	-40.9	-45.0	-48.8	-52.6
260	-26.4	-30.2	-33.9	-30.9	-34.7	-38.4	-40.6	-44.4	-48.2
240	-24.4	-28.2	-32.0	-28.1	-31.9	-35.7	-36.1	-39.9	-43.7
220	-22.0	-25.9	-29.7	-25.0	-28.9	-32.7	-31.3	-35.2	-39.1
200	-19.3	-23.2	-27.1	-21.6	-25.5	-29.4	-26.5	-30.4	-34.3
180	-16.2	-20.2	-24.1	-17.9	-21.9	-25.8	-21.4	-25.4	-29.3
160	-12.8	-16.8	-20.8	-13.9	-17.9	-21.9	-16.2	-20.2	-24.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm			6 mm			13 mm		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	103.3			115.7			137.2		
1800	154.6			167.0			188.1	119.6	
2000	205.3	137.3		218.2	149.7		239.5	170.8	101.9
2200	257.8	187.9	119.9	271.0	200.7	132.3	292.0	221.9	153.6
2400	312.7	239.7	170.7	325.9	252.8	183.2	345.6	274.0	204.4
2600		293.7	221.9		307.0	234.9		327.4	256.2
2800		349.8	275.1			288.3			309.1
3000			330.8			343.6			

1. **Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -52m/+52m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm			6 mm			13 mm		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
240	-16	-13	-11	-11	-8	-6	1	4	6
220	-17	-15	-12	-13	-10	-8	-3	0	2
200	-18	-16	-13	-15	-12	-10	-7	-4	-2
180	-19	-16	-14	-16	-14	-11	-10	-7	-5
160	-18	-16	-13	-16	-14	-11	-11	-9	-6
140	-18	-15	-13	-16	-13	-11	-11	-9	-6

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 - Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

TO2 FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-0.9	-1.9	-8.5	-9.4	-10.4	-26.1	-27.0	-27.9
300	0.0	-0.9	-1.9	-10.4	-11.3	-12.3	-26.4	-27.4	-28.3
280	0.0	-0.9	-1.9	-12.3	-13.3	-14.2	-26.8	-27.7	-28.7
260	0.0	-0.9	-1.9	-14.0	-14.9	-15.9	-27.0	-27.9	-28.8
240	-0.8	-1.8	-2.7	-14.9	-15.8	-16.8	-26.4	-27.3	-28.3
220	-2.2	-3.2	-4.1	-15.0	-16.0	-16.9	-25.1	-26.1	-27.0
200	-3.0	-4.0	-4.9	-14.4	-15.3	-16.3	-23.1	-24.1	-25.0
180	-3.2	-4.1	-5.1	-13.0	-13.9	-14.9	-20.5	-21.4	-22.3
160	-2.7	-3.7	-4.6	-10.8	-11.7	-12.7	-17.1	-18.0	-18.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	200.3	135.8							
1600	283.7	222.4	158.6						
1800		304.7	244.2	178.9					
2000			325.5	242.5	176.4				
2200				310.2	239.8	173.9	147.5		
2400					307.4	237.2	186.8	127.4	
2600						304.6	228.8	166.1	
2800							274.5	206.5	145.9
3000							324.8	250.2	185.1
3200								298.0	227.0
3400								350.1	272.5
3600									322.7

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -36 m/+36 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -50 m/+50 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO2 - Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
240	-7	-6	-5	-15	-14	-12	-26	-24	-23
220	-8	-7	-5	-17	-15	-14	-28	-27	-25
200	-9	-7	-6	-18	-16	-15	-30	-29	-27
180	-9	-8	-6	-19	-17	-16	-32	-30	-29
160	-9	-8	-7	-19	-18	-16	-33	-31	-29
140	-9	-8	-7	-19	-18	-16	-34	-32	-30

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

TO2 Takeoff Speeds
20% Thrust Reduction
V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
240	154	154	156	147	147	150			
230	149	150	153	143	143	147			
220	146	147	150	139	140	144	135	136	140
210	142	143	147	136	136	141	131	132	137
200	138	139	143	132	133	137	127	128	133
190	133	135	140	127	129	134	123	125	130
180	128	131	137	123	125	131	119	121	127
170	123	127	133	118	121	127	114	117	124
160	118	122	129	113	117	124	109	113	120
150	113	118	126	108	112	120	104	109	117
140	107	113	122	102	108	116	99	104	113

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	6	7	9	11			3	4	4	5			-1	-2	-2	-2		
50	122	3	5	6	8	11	13	2	2	3	4	5	6	-1	-1	-1	-2	-2	-3
40	104	1	2	4	5	7	9	1	1	2	3	4	5	0	-1	-1	-1	-2	-2
30	86	0	0	2	3	5	7	0	0	1	2	3	4	0	0	0	-1	-1	-2
20	68	0	0	1	2	4	5	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-76	0	0	1	2	3	5	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
240	-3	-1	0	1	1	-1	-1	0	0	0	0	0	0
220	-3	-1	0	1	1	-1	-1	0	0	0	0	0	0
200	-3	-1	0	1	2	-1	-1	0	0	0	0	0	1
180	-2	-1	0	1	2	-2	-1	0	0	0	1	1	1
160	-2	-1	0	1	2	-2	-1	0	0	0	1	1	2
140	-3	-1	0	1	3	-2	-1	0	0	1	1	2	2

***V1 not to exceed VR.**

Minimum Control Speeds
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	105	106	102	103		
50	122	108	108	102	103	98	99
40	104	114	114	105	106	98	99
30	86	119	119	110	111	102	103
20	68	119	119	113	114	105	106
-60	-76	120	120	114	114	108	108

TO1 V1(MCG), Minimum VR
8% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	100	101	98	99		
50	122	103	104	98	99	94	95
40	104	109	109	101	102	94	95
30	86	113	114	106	106	98	99
20	68	114	114	108	109	101	102
-60	-76	115	115	109	109	104	104

TO2 V1(MCG), Minimum VR
20% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	93	94	91	92		
50	122	96	97	91	92	88	89
40	104	101	102	94	95	88	89
30	86	106	106	98	99	91	92
20	68	106	106	101	102	94	95
-60	-76	107	107	102	102	96	97

Go-around EPR

Based on engine bleed for packs on and anti-ice off

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)											
°F	°C	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
150	66	70	1.235	1.238	1.241	1.242	1.243	1.243	1.244	1.243	1.243	1.242	1.241	1.24
141	61	65	1.253	1.257	1.26	1.262	1.263	1.264	1.266	1.266	1.266	1.265	1.265	1.265
133	56	60	1.278	1.276	1.28	1.282	1.284	1.285	1.287	1.288	1.288	1.289	1.289	1.289
124	51	55	1.307	1.304	1.303	1.302	1.304	1.306	1.309	1.31	1.311	1.312	1.313	1.314
115	46	50	1.334	1.334	1.333	1.33	1.332	1.33	1.331	1.332	1.334	1.335	1.337	1.338
106	41	45	1.358	1.366	1.365	1.364	1.364	1.365	1.362	1.359	1.357	1.359	1.361	1.363
97	36	40	1.381	1.399	1.397	1.397	1.395	1.394	1.394	1.392	1.39	1.388	1.387	1.388
88	31	35	1.391	1.431	1.431	1.43	1.428	1.426	1.425	1.424	1.423	1.421	1.418	1.416
79	26	30	1.391	1.439	1.453	1.465	1.461	1.459	1.456	1.457	1.456	1.454	1.451	1.447
70	21	25	1.391	1.439	1.453	1.466	1.477	1.487	1.484	1.481	1.482	1.486	1.482	1.477
62	17	20	1.391	1.439	1.453	1.466	1.477	1.487	1.496	1.501	1.500	1.500	1.500	1.500
53	12	15	1.391	1.439	1.453	1.466	1.477	1.487	1.498	1.51	1.515	1.514	1.514	1.514
44	7	10	1.391	1.439	1.453	1.466	1.477	1.487	1.498	1.51	1.518	1.527	1.528	1.528
35	2	5	1.391	1.439	1.453	1.466	1.477	1.487	1.498	1.51	1.518	1.533	1.542	1.546
31 & BELOW	1 & BELOW	3 & BELOW	1.391	1.439	1.453	1.466	1.477	1.487	1.498	1.51	1.518	1.533	1.542	1.551

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.003	0.003	0.003	0.003	0.004	0.004	0.005
1 PACK ON - 2 BLEED SOURCES	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
1 PACK ON - 1 BLEED SOURCE	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
WING ANTI-ICE ON	-0.002	-0.004	-0.004	-0.005	-0.005	-0.006	0-.006

Max Climb EPR

Based on engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	1.108	1.096	1.096	1.109	1.123	1.113	1.099	1.116	1.111	1.108
50	1.139	1.129	1.113	1.109	1.123	1.113	1.099	1.116	1.111	1.108
40	1.174	1.166	1.152	1.143	1.130	1.113	1.099	1.116	1.111	1.108
30	1.181	1.210	1.197	1.188	1.178	1.145	1.104	1.116	1.111	1.108
20	1.181	1.210	1.234	1.239	1.232	1.198	1.163	1.130	1.111	1.108
10	1.181	1.210	1.234	1.266	1.293	1.263	1.240	1.196	1.175	1.173
0	1.181	1.210	1.234	1.266	1.303	1.316	1.342	1.297	1.263	1.258
-10	1.181	1.210	1.234	1.266	1.303	1.316	1.368	1.420	1.400	1.389
-15 & BELOW	1.181	1.210	1.234	1.266	1.303	1.316	1.368	1.441	1.434	1.426

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003	-0.004	-0.005
ENGINE & WING*	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013	-0.017	-0.019
ENGINE & WING**	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.024	-0.029	-0.033

***Wing anti-ice on, packs on.**
****Wing anti-ice on, single bleed source and both packs off.**

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280
40000 (.82M)	**PITCH ATT**	**3.5**	**3.5**		
	V/S (FT/MIN)	1300	600		
30000 (280 KIAS)	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	1900	1400	900	500
20000 (270 KIAS)	**PITCH ATT**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	3100	2300	1700	1300
10000 (270 KIAS)	**PITCH ATT**	**9.0**	**8.0**	**7.5**	**7.5**
	V/S (FT/MIN)	3900	3000	2300	1800
SEA LEVEL (270 KIAS)	**PITCH ATT**	**11.0**	**9.5**	**9.0**	**8.5**
	V/S (FT/MIN)	4500	3500	2700	2200

Cruise

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280
40000 (.82 M)	**PITCH ATT**	**2.0**	**2.5**		
	EPR	1.129	1.249		
	(Alt Mode %N1)	(79.0)	(83.4)		
35000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**
	EPR	1.065	1.118	1.203	1.356
	(Alt Mode %N1)	(76.7)	(78.9)	(82.3)	(87.2)
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**
	EPR	1.021	1.059	1.119	1.196
	(Alt Mode %N1)	(73.1)	(75.2)	(78.2)	(81.7)
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**
	EPR	0.997	1.024	1.067	1.124
	(Alt Mode %N1)	(69.7)	(71.7)	(74.4)	(77.5)
20000 (270 KIAS)	**PITCH ATT**	**2.0**	**2.5**	**3.0**	**4.0**
	EPR	0.986	1.008	1.039	1.081
	(Alt Mode %N1)	(65.2)	(67.7)	(70.5)	(73.6)
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**4.0**
	EPR	0.977	0.994	1.018	1.048
	(Alt Mode %N1)	(61.8)	(64.0)	(66.8)	(70.0)

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280
40000 (.82M)	**PITCH ATT**	**-1.0**	**-0.5**		
	V/S (FT/MIN)	-2500	-2400		
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**
	V/S (FT/MIN)	-2200	-1900	-1900	-1900
20000 (270 KIAS)	**PITCH ATT**	**-1.0**	**0.0**	**0.5**	**1.5**
	V/S (FT/MIN)	-1800	-1600	-1600	-1600
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**
	V/S (FT/MIN)	-1700	-1500	-1400	-1400
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**
	V/S (FT/MIN)	-1500	-1400	-1300	-1300

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 160	200	240	280
10000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	1.004	1.017	1.029	1.040
	(Alt Mode %N1)	(51.3)	(56.8)	(61.7)	(65.9)
	KIAS	202	216	234	253
5000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	0.999	1.009	1.019	1.027
	(Alt Mode %N1)	(47.4)	(52.6)	(57.4)	(61.8)
	KIAS	202	216	233	251

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 160	200	240	280
FLAPS 0 (GEAR UP) (VREF30 + 80)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**
	EPR	1.000	1.010	1.020	1.040
	(Alt Mode %N1)	(48.3)	(53.9)	(58.8)	(63.2)
	KIAS	201	216	229	241
FLAPS 1 (GEAR UP) (VREF30 + 60)	**PITCH ATT**	**6.0**	**6.5**	**7.0**	**7.0**
	EPR	1.020	1.030	1.050	1.060
	(Alt Mode %N1)	(49.5)	(55.4)	(60.9)	(65.4)
	KIAS	181	196	209	221
FLAPS 5 (GEAR UP) (VREF30 + 40)	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**
	EPR	1.030	1.050	1.070	1.090
	(Alt Mode %N1)	(50.1)	(57.2)	(62.4)	(66.7)
	KIAS	161	176	189	201
FLAPS 15 (GEAR UP) (VREF30 + 20)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**
	EPR	1.040	1.060	1.090	1.110
	(Alt Mode %N1)	(51.5)	(58.9)	(64.4)	(68.9)
	KIAS	141	156	169	181
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	1.070	1.100	1.130	1.170
	(Alt Mode %N1)	(58.6)	(65.7)	(70.6)	(74.9)
	KIAS	141	156	169	181

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 20 (VREF20 + 10)	**PITCH ATT**	**1.0**	**1.5**	**1.5**	**1.5**
	EPR	1.010	1.010	1.020	1.020
	(Alt Mode %N1)	(34.7)	(40.2)	(45.0)	(49.3)
	KIAS	142	157	172	185
FLAPS 25 (VREF25 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**
	EPR	1.030	1.040	1.050	1.070
	(Alt Mode %N1)	(44.1)	(50.7)	(56.2)	(60.6)
	KIAS	138	153	166	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**-0.5**	**0.0**	**0.0**	**0.0**
	EPR	1.050	1.070	1.090	1.110
	(Alt Mode %N1)	(50.5)	(56.9)	(62.4)	(66.8)
	KIAS	131	146	159	171

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 11

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	-1	32500*	32500*	32500*	32500*	31900
290	31100	-3	33400*	33400*	33400*	33400*	32700
280	31800	-5	34400*	34400*	34400*	34400*	33400
270	32600	-7	35300*	35300*	35300*	35300*	34200
260	33400	-8	36000*	36000*	36000*	36000*	35000
250	34200	-10	36700*	36700*	36700*	36700*	35800
240	35100	-12	37500*	37500*	37500*	37500*	36600
230	36000	-14	38400*	38400*	38400*	38400*	37500
220	36900	-14	39300*	39300*	39300*	39300*	38500
210	37900	-14	40200*	40200*	40200*	40200*	39400
200	38900	-14	41200*	41200*	41200*	41200*	40400
190	40000	-14	42200*	42200*	42200*	42200*	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	4	31200*	31200*	31200*	31200*	31200*
290	31100	3	32200*	32200*	32200*	32200*	32200*
280	31800	1	33300*	33300*	33300*	33300*	33300*
270	32600	-1	34300*	34300*	34300*	34300*	34200
260	33400	-3	35400*	35400*	35400*	35400*	35000
250	34200	-5	36200*	36200*	36200*	36200*	35800
240	35100	-7	37000*	37000*	37000*	37000*	36600
230	36000	-9	37800*	37800*	37800*	37800*	37500
220	36900	-9	38700*	38700*	38700*	38700*	38500
210	37900	-9	39600*	39600*	39600*	39600*	39400
200	38900	-9	40600*	40600*	40600*	40600*	40400
190	40000	-9	41600*	41600*	41600*	41600*	41500
180	41100	-9	42600*	42600*	42600*	42600*	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	10	26700*	26700*	26700*	26700*	26700*
290	31100	8	27800*	27800*	27800*	27800*	27800*
280	31800	7	30300*	30300*	30300*	30300*	30300*
270	32600	5	31900*	31900*	31900*	31900*	31900*
260	33400	3	33200*	33200*	33200*	33200*	33200*
250	34200	1	34500*	34500*	34500*	34500*	34500*
240	35100	-1	35500*	35500*	35500*	35500*	35500*
230	36000	-3	36300*	36300*	36300*	36300*	36300*
220	36900	-3	37200*	37200*	37200*	37200*	37200*
210	37900	-3	38100*	38100*	38100*	38100*	38100*
200	38900	-3	39100*	39100*	39100*	39100*	39100*
190	40000	-3	40000*	40000*	40000*	40000*	40000*
180	41100	-3	41100*	41100*	41100*	41100*	41100*
170	42300	-3	42100*	42100*	42100*	42100*	42100*
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
300	EPR	1.106	1.131	1.168	1.229	1.326					
	MACH	.772	.802	.834	.840	.838					
	KIAS	325	325	325	314	300					
	FF/ENG	4499	4533	4621	4641	4746					
280	EPR	1.083	1.106	1.135	1.182	1.247	1.365				
	MACH	.772	.802	.834	.841	.839	.838				
	KIAS	325	325	325	314	300	287				
	FF/ENG	4289	4321	4375	4343	4305	4482				
260	EPR	1.064	1.085	1.111	1.142	1.193	1.266				
	MACH	.770	.796	.821	.838	.841	.839				
	KIAS	324	322	319	313	301	287				
	FF/ENG	4095	4094	4085	4045	3988	3985				
240	EPR	1.047	1.066	1.088	1.115	1.148	1.201	1.284			
	MACH	.746	.772	.799	.823	.839	.840	.839			
	KIAS	313	312	310	307	300	287	274			
	FF/ENG	3762	3759	3758	3747	3705	3645	3691			
220	EPR	1.033	1.048	1.068	1.090	1.118	1.153	1.209	1.297		
	MACH	.721	.746	.773	.800	.825	.840	.840	.839		
	KIAS	302	300	299	297	294	287	274	261		
	FF/ENG	3437	3429	3427	3425	3413	3372	3337	3416		
200	EPR	1.021	1.033	1.048	1.068	1.090	1.118	1.155	1.212	1.300	
	MACH	.695	.719	.745	.772	.799	.825	.840	.840	.839	
	KIAS	290	289	287	286	284	281	274	262	249	
	FF/ENG	3123	3108	3100	3098	3095	3085	3065	3054	3127	
180	EPR	1.009	1.020	1.032	1.047	1.066	1.089	1.117	1.153	1.208	1.293
	MACH	.667	.690	.714	.740	.768	.796	.822	.839	.840	.839
	KIAS	278	276	275	273	272	270	268	262	250	238
	FF/ENG	2881	2853	2834	2775	2772	2770	2779	2784	2773	2826
160	EPR	1.000	1.008	1.018	1.030	1.044	1.063	1.085	1.114	1.147	1.199
	MACH	.636	.659	.682	.707	.733	.761	.790	.817	.837	.841
	KIAS	264	263	261	260	259	257	256	254	249	239
	FF/ENG	2589	2558	2532	2463	2454	2449	2464	2494	2505	2500

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	226	213	200	191	182	174	167	161
567	524	485	453	425	400	382	366	351	337	324
851	786	729	680	638	600	573	549	526	505	486
1136	1050	974	908	851	800	764	732	701	673	648
1423	1314	1218	1136	1064	1000	956	914	876	842	810
1711	1580	1463	1364	1277	1200	1147	1097	1052	1010	972
2000	1846	1709	1592	1491	1400	1337	1279	1226	1177	1133
2290	2112	1954	1820	1704	1600	1528	1462	1401	1345	1295
2581	2380	2201	2049	1918	1800	1720	1645	1576	1513	1456
2874	2649	2449	2279	2132	2000	1910	1827	1751	1680	1617

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.6	0:39	3.1	0:37	2.6	0:36	2.3	0:35	2.0	0:34
400	7.6	1:14	6.8	1:11	5.9	1:06	5.3	1:04	4.8	1:01
600	11.5	1:50	10.5	1:44	9.1	1:37	8.4	1:33	7.6	1:29
800	15.4	2:26	14.2	2:18	12.4	2:09	11.4	2:03	10.4	1:57
1000	19.4	3:02	17.9	2:53	15.6	2:40	14.4	2:33	13.2	2:26
1200	23.3	3:38	21.5	3:27	18.8	3:12	17.4	3:03	16.0	2:54
1400	27.1	4:15	25.1	4:02	21.9	3:44	20.3	3:33	18.7	3:23
1600	31.0	4:53	28.7	4:37	25.1	4:16	23.2	4:03	21.5	3:51
1800	34.7	5:30	32.2	5:13	28.2	4:48	26.1	4:34	24.2	4:20
2000	38.5	6:08	35.7	5:49	31.2	5:21	29.0	5:04	26.9	4:49

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
5	-0.3	-0.2	0.0	0.2	0.5	0.7	1.0	1.2
10	-0.7	-0.4	0.0	0.5	1.1	1.6	2.2	2.7
15	-1.1	-0.6	0.0	0.8	1.7	2.5	3.4	4.2
20	-1.6	-0.8	0.0	1.1	2.2	3.4	4.5	5.7
25	-2.0	-1.0	0.0	1.4	2.8	4.2	5.7	7.1
30	-2.5	-1.2	0.0	1.6	3.3	5.0	6.7	8.5
35	-3.0	-1.4	0.0	1.8	3.8	5.7	7.8	9.9
40	-3.4	-1.7	0.0	2.0	4.2	6.5	8.8	11.3

Long Range Cruise Enroute Fuel and Time - High Altitude

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
525	495	467	442	420	400	383	368	353	340	328
1045	985	931	883	840	800	767	737	709	683	659
1566	1477	1396	1324	1259	1200	1152	1107	1065	1026	991
2089	1970	1862	1766	1679	1600	1536	1476	1420	1369	1322
2614	2465	2329	2208	2100	2000	1920	1845	1776	1712	1653
3141	2961	2797	2651	2520	2400	2304	2215	2131	2054	1984
3670	3458	3265	3094	2941	2800	2688	2584	2486	2397	2315
4201	3957	3735	3538	3362	3200	3072	2952	2842	2739	2645
4734	4457	4206	3983	3783	3600	3456	3321	3196	3081	2975
5269	4959	4677	4428	4205	4000	3840	3690	3551	3423	3305
5806	5463	5151	4874	4627	4400	4223	4058	3905	3764	3634
6346	5968	5625	5321	5049	4800	4607	4426	4259	4104	3962
6888	6475	6100	5768	5471	5200	4990	4794	4612	4444	4290
7433	6984	6576	6216	5894	5600	5373	5161	4964	4783	4617
7981	7495	7054	6665	6317	6000	5756	5528	5316	5121	4943
8532	8008	7533	7114	6741	6400	6138	5894	5668	5460	5269
9086	8523	8013	7565	7165	6800	6521	6261	6020	5797	5594
9643	9041	8496	8017	7589	7200	6903	6627	6370	6134	5918
10204	9561	8980	8469	8014	7600	7285	6992	6721	6470	6241
10769	10084	9465	8922	8440	8000	7667	7357	7070	6806	6564

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37 & ABOVE	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
400	4.7	1:01	4.5	0:60	4.4	0:59	4.2	0:58	4.1	0:57
800	10.2	1:56	9.9	1:53	9.6	1:51	9.3	1:49	9.0	1:47
1200	15.6	2:52	15.1	2:48	14.7	2:44	14.3	2:40	13.9	2:38
1600	21.0	3:49	20.3	3:43	19.7	3:37	19.2	3:32	18.7	3:28
2000	26.4	4:45	25.4	4:38	24.7	4:31	24.0	4:24	23.5	4:19
2400	31.6	5:44	30.3	5:35	29.5	5:26	28.7	5:18	28.1	5:10
2800	36.7	6:42	35.3	6:31	34.3	6:21	33.4	6:11	32.6	6:02
3200	41.8	7:41	40.1	7:29	39.0	7:16	38.0	7:05	37.1	6:54
3600	46.7	8:41	44.9	8:27	43.6	8:13	42.4	7:60	41.5	7:47
4000	51.7	9:42	49.6	9:25	48.2	9:09	46.9	8:55	45.8	8:40
4400	56.4	10:44	54.2	10:25	52.7	10:08	51.3	9:51	50.1	9:35
4800	61.2	11:46	58.8	11:25	57.2	11:06	55.6	10:47	54.4	10:29
5200	65.8	12:49	63.3	12:26	61.6	12:05	59.9	11:45	58.5	11:24
5600	70.4	13:53	67.8	13:28	65.8	13:05	64.1	12:43	62.6	12:20
6000	74.9	14:57	72.2	14:30	70.1	14:05	68.2	13:41	66.7	13:16
6400	79.4	16:04	76.4	15:34	74.2	15:07	72.2	14:41	70.6	14:14
6800	83.9	17:11	80.7	16:39	78.3	16:09	76.2	15:40	74.4	15:11
7200	88.3	18:19	84.9	17:44	82.4	17:12	80.1	16:41	78.3	16:10
7600	92.6	19:28	89.0	18:50	86.3	18:16	83.9	17:43	82.0	17:09
8000	96.9	20:38	93.2	19:57	90.3	19:20	87.8	18:45	85.7	18:09

Long Range Cruise Enroute Fuel and Time - High Altitude

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.1	-0.5	0.0	0.6	2.1	6.3	12.7	21.3
20	-2.1	-1.1	0.0	1.1	4.0	9.5	17.3	27.5
30	-3.1	-1.6	0.0	1.7	5.7	12.3	21.4	32.9
40	-4.2	-2.1	0.0	2.4	7.4	14.9	24.9	37.5
50	-5.3	-2.7	0.0	3.1	8.8	17.1	28.0	41.4
60	-6.4	-3.2	0.0	3.8	10.2	19.1	30.5	44.5
70	-7.5	-3.8	0.0	4.5	11.4	20.7	32.6	46.8
80	-8.6	-4.3	0.0	5.1	12.4	22.1	34.1	48.4
90	-9.7	-4.9	0.0	5.6	13.4	23.2	35.1	49.2
100	-10.9	-5.4	0.0	6.1	14.1	24.0	35.7	49.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)						
	260	240	220	200	180	160	140
43				43	10	0	7
41			42	12	0	3	19
39		38	12	0	2	14	33
37	32	10	0	1	11	28	49
35	7	0	1	10	24	43	64
33	0	2	10	23	39	58	78
31	3	10	22	37	54	72	91
29	12	23	36	52	68	85	102
27	24	37	51	66	81	97	112
25	38	51	65	79	93	107	121

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent at .84/310/250 KIAS

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	93	100	107	114	119	124	130	136	142	148
TIME (MINUTES)	19	20	21	22	23	23	24	25	25	26

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	EPR	1.023	1.031	1.047	1.059	1.075	1.123	1.198			
	KIAS	260	260	262	277	302	306	311			
	FF/ENG	4350	4320	4190	4230	4440	4530	4710			
280	EPR	1.020	1.027	1.040	1.055	1.067	1.108	1.169	1.356		
	KIAS	251	251	253	261	286	295	299	279		
	FF/ENG	4060	4020	3890	3890	4060	4180	4300	4550		
260	EPR	1.017	1.023	1.034	1.052	1.063	1.092	1.145	1.265		
	KIAS	242	242	243	246	266	283	287	279		
	FF/ENG	3770	3720	3690	3580	3740	3830	3920	4060		
240	EPR	1.014	1.019	1.029	1.045	1.059	1.074	1.124	1.203		
	KIAS	232	233	234	235	247	272	275	279		
	FF/ENG	3560	3510	3460	3350	3380	3490	3560	3710		
220	EPR	1.010	1.015	1.024	1.037	1.055	1.066	1.105	1.167	1.357	
	KIAS	223	223	224	224	230	251	262	266	249	
	FF/ENG	3280	3230	3170	3140	3050	3160	3220	3310	3590	
200	EPR	1.006	1.009	1.017	1.028	1.047	1.061	1.084	1.138	1.249	
	KIAS	216	216	216	216	216	229	249	253	249	
	FF/ENG	3010	2960	2890	2850	2760	2800	2880	2950	3130	
180	EPR	1.001	1.004	1.010	1.019	1.033	1.056	1.068	1.113	1.186	1.289
	KIAS	209	209	209	209	209	209	230	239	242	232
	FF/ENG	2820	2700	2630	2580	2550	2470	2570	2600	2770	2870
160	EPR	0.997	0.999	1.004	1.010	1.022	1.039	1.062	1.088	1.147	1.202
	KIAS	202	202	202	202	202	202	206	224	227	229
	FF/ENG	2570	2510	2380	2320	2290	2260	2220	2320	2440	2560
140	EPR	0.994	0.996	0.998	1.003	1.011	1.025	1.044	1.069	1.115	1.154
	KIAS	194	194	194	194	194	194	194	202	211	213
	FF/ENG	2330	2260	2190	2080	2040	2000	1940	1970	2100	2170

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.057	1.070	1.096	1.134	1.192
	KIAS	228	228	228	228	228
	FF/ENG	4680	4530	4520	4540	4570
280	EPR	1.050	1.061	1.083	1.118	1.168
	KIAS	222	222	222	222	222
	FF/ENG	4350	4310	4180	4200	4210
260	EPR	1.043	1.053	1.071	1.101	1.145
	KIAS	216	216	216	216	216
	FF/ENG	4030	3990	3850	3850	3930
240	EPR	1.036	1.045	1.061	1.085	1.123
	KIAS	209	209	209	209	209
	FF/ENG	3720	3680	3630	3590	3600
220	EPR	1.029	1.037	1.051	1.071	1.103
	KIAS	203	203	203	203	203
	FF/ENG	3480	3440	3380	3270	3270
200	EPR	1.023	1.029	1.042	1.057	1.084
	KIAS	196	196	196	196	196
	FF/ENG	3180	3140	3080	3040	2950
180	EPR	1.017	1.022	1.033	1.046	1.066
	KIAS	189	189	189	189	189
	FF/ENG	2960	2840	2790	2740	2650
160	EPR	1.012	1.016	1.024	1.035	1.050
	KIAS	182	182	182	182	182
	FF/ENG	2670	2620	2500	2450	2410
140	EPR	1.008	1.011	1.016	1.025	1.037
	KIAS	174	174	174	174	174
	FF/ENG	2400	2340	2270	2170	2120

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Advisory Information — Section 12

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	180000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 180000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	830	+25/-15	15	-35	125	10	-10	15	-15	65	10	25
MAX AUTO	1100	+20/-15	25	-50	175	0	0	25	-25	115	0	0
AUTOBRAKE 4	1350	+30/-20	35	-65	245	0	-5	35	-35	145	0	0
AUTOBRAKE 3	1620	+35/-30	45	-85	305	10	-10	45	-45	175	0	5
AUTOBRAKE 2	1810	+40/-35	50	-95	355	15	-35	50	-50	160	15	15
AUTOBRAKE 1	1930	+45/-40	60	-105	395	40	-50	50	-50	155	110	110

Good Reported Braking Action

MAX MANUAL	1130	+20/-20	30	-55	220	30	-25	25	-25	95	50	115
MAX AUTO	1240	+25/-25	30	-60	225	20	-15	25	-30	110	55	125
AUTOBRAKE 4	1350	+30/-30	35	-70	250	5	-10	35	-35	145	5	25
AUTOBRAKE 3	1620	+35/-35	45	-85	305	10	-10	45	-45	175	0	5

Medium Reported Braking Action

MAX MANUAL	1505	+35/-35	45	-90	360	70	-55	35	-35	120	145	370
MAX AUTO	1590	+35/-35	45	-90	360	65	-40	35	-35	140	140	370
AUTOBRAKE 4	1590	+35/-35	45	-90	360	65	-45	40	-40	135	155	395
AUTOBRAKE 3	1695	+40/-35	45	-95	385	45	-30	45	-45	175	75	270

Poor Reported Braking Action

MAX MANUAL	1915	+50/-45	60	-130	575	175	-100	50	-50	135	320	905
MAX AUTO	2030	+50/-45	60	-130	570	175	-100	50	-50	135	325	915
AUTOBRAKE 4	2030	+50/-45	60	-130	570	170	-105	50	-50	135	330	930
AUTOBRAKE 3	2030	+50/-45	60	-135	575	170	-85	50	-50	170	320	920

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

BRAKING CONFIGURATION	REF DIST* 180000 KG LANDING WT	WT ADJ PER 5000 KG ABOVE / BELOW 180000 KG	ALT ADJ PER 1000 FT ABOVE S.L.	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DN HILL	SLOPE ADJ PER 1% UP HILL	TEMP ADJ PER 10°C ABV ISA	TEMP ADJ PER 10°C BLW ISA	APP SPD ADJ PER 10 KTS ABOVE VREF25	REVERSE THRUST ADJ ONE REV	REVERSE THRUST ADJ NO REV
MAX MANUAL	870	+25/-15	20	-35	130	10	-10	20	-20	65	15	30
MAX AUTO	1175	+20/-15	25	-50	185	0	0	30	-30	120	0	0
AUTOBRAKE 4	1450	+30/-20	40	-70	255	0	-5	40	-40	155	0	0
AUTOBRAKE 3	1750	+40/-30	45	-90	315	15	-15	50	-50	175	5	5
AUTOBRAKE 2	1945	+45/-40	55	-100	365	25	-45	50	-50	155	40	45
AUTOBRAKE 1	2045	+50/-45	65	-110	405	55	-60	55	-55	155	160	170

Good Reported Braking Action

MAX MANUAL	1185	+25/-25	30	-60	225	30	-25	25	-30	95	60	140
MAX AUTO	1310	+25/-25	30	-60	230	20	-15	30	-30	115	65	150
AUTOBRAKE 4	1450	+30/-30	40	-70	260	5	-10	40	-40	155	5	25
AUTOBRAKE 3	1745	+40/-40	45	-90	315	15	-15	50	-50	175	5	5

Medium Reported Braking Action

MAX MANUAL	1580	+35/-35	45	-90	370	70	-55	40	-40	120	170	435
MAX AUTO	1675	+35/-35	45	-90	365	65	-45	40	-40	140	160	430
AUTOBRAKE 4	1675	+35/-35	45	-90	370	65	-40	40	-40	150	165	450
AUTOBRAKE 3	1820	+40/-40	50	-100	395	45	-35	50	-50	175	70	295

Poor Reported Braking Action

MAX MANUAL	2000	+50/-50	65	-135	580	175	-105	50	-50	135	365	1050
MAX AUTO	2130	+50/-45	65	-135	575	175	-105	50	-50	135	365	1065
AUTOBRAKE 4	2130	+50/-50	65	-135	580	170	-105	50	-50	135	370	1080
AUTOBRAKE 3	2130	+50/-45	65	-135	585	170	-85	55	-55	175	340	1050

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

BRAKING CONFIGURATION	REF DIST* 180000 KG LANDING WT	WT ADJ PER 5000 KG ABOVE / BELOW 180000 KG	ALT ADJ PER 1000 FT ABOVE S.L.	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DN HILL	SLOPE ADJ PER 1% UP HILL	TEMP ADJ PER 10°C ABV ISA	TEMP ADJ PER 10°C BLW ISA	APP SPD ADJ PER 10 KTS ABOVE VREF20	REVERSE THRUST ADJ ONE REV	REVERSE THRUST ADJ NO REV
	LANDING DISTANCE AND ADJUSTMENTS (M)											
MAX MANUAL	905	+30/-15	20	-35	125	10	-10	20	-20	70	15	35
MAX AUTO	1225	+25/-25	30	-55	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1520	+30/-35	40	-75	250	0	-5	40	-40	165	0	0
AUTOBRAKE 3	1815	+40/-40	50	-90	315	10	-20	50	-50	185	5	5
AUTOBRAKE 2	2000	+50/-50	60	-105	360	30	-45	55	-55	170	45	45
AUTOBRAKE 1	2110	+55/-55	70	-115	400	55	-65	60	-60	165	170	175

Good Reported Braking Action

MAX MANUAL	1245	+25/-25	30	-60	215	30	-25	30	-30	100	65	160
MAX AUTO	1305	+25/-25	35	-65	225	20	-15	30	-30	120	75	175
AUTOBRAKE 4	1525	+35/-35	40	-75	260	5	-10	40	-40	165	5	25
AUTOBRAKE 3	1815	+40/-40	50	-90	315	10	-20	50	-50	185	5	5

Medium Reported Braking Action

MAX MANUAL	1665	+40/-40	50	-95	355	70	-60	40	-40	125	195	510
MAX AUTO	1665	+40/-40	50	-95	350	65	-45	40	-40	140	185	505
AUTOBRAKE 4	1685	+40/-40	50	-95	355	60	-40	45	-45	155	190	530
AUTOBRAKE 3	1895	+45/-45	55	-105	385	40	-35	50	-50	185	80	350

Poor Reported Braking Action

MAX MANUAL	2120	+55/-50	70	-140	550	165	-110	55	-55	145	415	1245
MAX AUTO	2120	+55/-50	70	-140	545	165	-110	55	-55	140	420	1260
AUTOBRAKE 4	2120	+55/-55	70	-140	545	160	-110	55	-55	145	425	1275
AUTOBRAKE 3	2150	+55/-50	70	-140	555	150	-90	55	-55	180	390	1245

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 65 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1580	35/-35	50	-90/355	75/-55	20/-20	120	170	435
ANTISKID (FLAPS 30)	VREF30	1505	35/-35	45	-90/345	70/-50	20/-20	120	145	370
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	915	25/-15	20	-35/130	10/-10	10/-10	75	-	20
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	835	25/-15	20	-35/125	10/-10	10/-10	70	-	10
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1060	40/-15	25	-45/150	15/-10	15/-15	75	30	65
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	960	25/-15	20	-35/135	10/-10	10/-10	65	20	45
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	905	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLAPS PRIMARY FAIL	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
FLAP/SLAT CONTROL	VREF20	900	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLIGHT CONTROL MODE	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
HYD PRESS SYS C	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
HYD PRESS SYS L+C	VREF30+20	1165	25/-20	25	-45/160	20/-15	15/-15	110	-	35
HYD PRESS SYS L+R	VREF30+20	1255	25/-20	30	-55/190	30/-25	20/-20	130	-	-
HYD PRESS SYS R+C	VREF30+20	1440	25/-25	35	-65/220	35/-30	20/-20	150	-	90
HYD PRESS SYS L (FLAPS 25)	VREF25	920	25/-15	20	-40/135	10/-10	10/-10	80	-	20
HYD PRESS SYS L (FLAPS 30)	VREF30	880	25/-15	20	-35/130	10/-10	10/-10	80	-	15
HYD PRESS SYS R (FLAPS 25)	VREF25	1015	20/-15	25	-45/160	20/-15	10/-10	95	-	30
HYD PRESS SYS R (FLAPS 30)	VREF30	960	15/-15	20	-45/155	20/-15	10/-10	90	-	25
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1055	35/-15	25	-45/145	10/-10	15/-15	65	25	60
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	935	25/-15	20	-35/135	10/-10	10/-10	65	20	40
PRI FLIGHT COMPUTERS	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
SLATS DRIVE	VREF30+30	1050	25/-15	25	-40/140	10/-10	10/-10	75	25	50
STABILIZER	VREF30+20	975	25/-15	20	-35/135	10/-10	10/-10	70	20	45

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1580	35/-35	50	-90/355	75/-55	20/-20	120	170	435
ANTISKID (FLAPS 30)	VREF30	1505	35/-35	45	-90/345	70/-50	20/-20	120	145	370
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1295	25/-25	35	-65/225	35/-30	20/-20	105	-	85
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1165	25/-25	30	-60/220	30/-25	15/-15	100	-	60
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1490	25/-25	45	-65/240	35/-30	20/-20	95	105	255
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1335	25/-25	35	-60/225	30/-25	20/-20	100	85	205
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1245	25/-25	35	-60/220	30/-25	15/-15	95	65	160
FLAPS PRIMARY FAIL	VREF20	1375	25/-25	35	-65/235	35/-30	20/-20	115	80	195
FLAP/SLAT CONTROL	VREF20	1235	25/-25	35	-60/215	30/-25	15/-15	95	65	150
FLIGHT CONTROL MODE	VREF20	1415	30/-30	35	-65/240	35/-30	20/-20	125	90	220
HYD PRESS SYS C	VREF20	1375	25/-25	35	-65/235	35/-30	20/-20	115	80	195
HYD PRESS SYS L+C	VREF30+20	1670	30/-30	50	-80/275	55/-45	25/-25	155	-	165
HYD PRESS SYS L+R	VREF30+20	1740	35/-35	50	-85/300	75/-60	25/-25	175	-	-
HYD PRESS SYS R+C	VREF30+20	1710	35/-35	50	-80/285	60/-50	25/-25	170	-	180
HYD PRESS SYS L (FLAPS 25)	VREF25	1320	25/-25	35	-65/240	45/-35	20/-20	120	-	100
HYD PRESS SYS L (FLAPS 30)	VREF30	1250	25/-25	35	-65/240	40/-35	20/-20	120	-	80
HYD PRESS SYS R (FLAPS 25)	VREF25	1320	25/-25	35	-65/240	45/-35	20/-20	120	-	100
HYD PRESS SYS R (FLAPS 30)	VREF30	1240	25/-25	35	-65/235	40/-30	20/-20	120	-	80
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1475	25/-25	40	-65/230	30/-25	20/-20	90	95	225
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1290	25/-25	35	-60/220	30/-25	20/-20	90	70	160
PRI FLIGHT COMPUTERS	VREF20	1415	30/-30	35	-65/240	35/-30	20/-20	125	90	220
SLATS DRIVE	VREF30+30	1450	25/-25	40	-65/240	35/-30	20/-20	100	90	215
STABILIZER	VREF30+20	1345	25/-25	35	-60/230	35/-25	20/-20	100	80	190

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2000	50/-45	65	-135/560	175/-105	25/-25	135	365	1050
ANTISKID (FLAPS 30)	VREF30	1915	50/-45	65	-130/550	175/-105	25/-25	135	325	900
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1815	45/-45	55	-105/385	100/-75	25/-25	140	-	290
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1610	35/-35	45	-100/370	85/-65	25/-25	130	-	205
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2015	45/-45	65	-105/390	80/-65	30/-30	125	295	825
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1785	40/-40	55	-95/365	75/-60	25/-25	120	240	650
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1665	40/-40	50	-90/360	75/-60	25/-25	120	195	510
FLAPS PRIMARY FAIL	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230	615
FLAP/SLAT CONTROL	VREF20	1645	35/-35	50	-90/355	70/-55	25/-25	120	185	485
FLIGHT CONTROL MODE	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255	695
HYD PRESS SYS C	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230	615
HYD PRESS SYS L+C	VREF30+20	2345	50/-50	80	-130/470	145/-105	35/-35	200	-	525
HYD PRESS SYS L+R	VREF30+20	2730	55/-55	80	-155/560	265/-170	45/-45	245	-	-
HYD PRESS SYS R+C	VREF30+20	2395	55/-50	75	-130/480	160/-115	35/-35	215	-	565
HYD PRESS SYS L (FLAPS 25)	VREF25	1860	45/-40	60	-110/420	115/-80	25/-25	155	-	325
HYD PRESS SYS L (FLAPS 30)	VREF30	1770	40/-40	50	-105/410	115/-80	25/-25	160	-	275
HYD PRESS SYS R (FLAPS 25)	VREF25	1850	45/-40	55	-110/420	115/-80	25/-25	155	-	315
HYD PRESS SYS R (FLAPS 30)	VREF30	1730	40/-35	50	-105/405	110/-75	25/-25	150	-	255
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1965	40/-40	60	-100/380	75/-60	25/-25	115	255	685
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1725	35/-35	50	-95/360	70/-55	25/-25	115	195	500
PRI FLIGHT COMPUTERS	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255	695
SLATS DRIVE	VREF30+30	1920	40/-40	60	-100/380	80/-65	25/-25	125	240	630
STABILIZER	VREF30+20	1790	40/-40	55	-100/370	75/-60	25/-25	120	215	570

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2715	75/-70	100	-230/1120	700/-255	40/-40	150	1010	5000
ANTISKID (FLAPS 30)	VREF30	2610	75/-65	95	-230/1110	670/-250	35/-35	150	925	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2430	65/-65	80	-160/620	255/-150	35/-35	170	-	730
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2145	55/-55	65	-145/605	225/-135	35/-35	155	-	510
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2565	65/-60	95	-150/605	200/-120	35/-35	150	620	2050
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2265	55/-55	75	-140/580	185/-110	35/-35	145	500	1585
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2120	55/-55	70	-135/560	170/-105	30/-30	140	420	1240
FLAPS PRIMARY FAIL	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
FLAP/SLAT CONTROL	VREF20	2090	55/-55	70	-135/555	170/-105	30/-30	135	400	1175
FLIGHT CONTROL MODE	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
HYD PRESS SYS C	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
HYD PRESS SYS L+C	VREF30+20	3160	75/-75	110	-200/780	395/-225	50/-50	230	-	1340
HYD PRESS SYS L+R	VREF30+20	4240	85/-80	120	-275/1075	1120/-440	75/-75	310	-	-
HYD PRESS SYS R+C	VREF30+20	3200	75/-75	115	-200/790	445/-230	50/-50	245	-	1400
HYD PRESS SYS L (FLAPS 25)	VREF25	2525	65/-60	80	-175/705	340/-175	40/-40	185	-	840
HYD PRESS SYS L (FLAPS 30)	VREF30	2415	60/-55	80	-170/700	340/-175	35/-35	185	-	730
HYD PRESS SYS R (FLAPS 25)	VREF25	2490	65/-60	80	-175/705	330/-175	40/-40	180	-	805
HYD PRESS SYS R (FLAPS 30)	VREF30	2330	55/-55	75	-165/685	315/-160	35/-35	175	-	655
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2475	55/-55	85	-145/595	175/-115	35/-35	130	525	1605
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2185	55/-55	75	-135/575	170/-105	30/-30	130	410	1200
PRI FLIGHT COMPUTERS	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
SLATS DRIVE	VREF30+30	2410	55/-55	80	-145/585	185/-120	35/-35	140	490	1445
STABILIZER	VREF30+20	2255	55/-55	75	-140/575	175/-115	35/-35	140	450	1335

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	241.1	221.5				
52	126	247.5	227.7				
50	122	253.1	234.0	215.5			
48	118	258.5	240.1	220.9			
46	115	263.3	245.7	226.4	208.9		
44	111	267.9	251.1	232.0	214.3		
42	108	272.5	256.6	237.5	219.5	201.7	
40	104	277.3	262.1	242.7	224.4	206.4	
38	100	282.1	267.6	247.6	228.8	211.0	194.1
36	97	286.8	273.4	252.4	233.2	215.4	198.3
34	93	291.6	279.1	257.1	237.7	219.6	202.4
32	90	291.7	284.6	262.2	242.3	223.7	206.4
30	86	291.7	289.9	267.4	246.5	227.8	210.2
28	82	291.7	290.0	272.7	250.9	231.8	213.9
26	79	291.8	290.0	277.7	255.3	235.8	217.7
24	75	291.9	290.1	277.8	259.4	239.1	221.4
22	72	292.0	290.1	277.8	263.3	242.2	224.8
20	68	292.0	290.2	277.9	263.4	245.4	226.8
18	64	292.0	290.3	277.9	263.4	248.3	228.8
16	61	292.1	290.3	277.9	263.5	248.9	230.7
14	57	292.1	290.3	278.0	263.5	249.5	232.6
12	54	292.2	290.4	278.0	263.5	249.8	233.9
10	50	292.2	290.4	278.1	263.6	249.9	235.0
-40	-40	293.6	291.6	279.2	264.7	250.9	237.8

Based on engine bleed for 2 packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight by 1000 kg.
With engine and wing anti-ice on, decrease weight by 1550 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 20250 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
300	0	17.3	19.1	21.2	26.1	29.1	32.6	36.4	40.8	46.0	47.9	53.9	61.0	60.4	68.1	77.1	73.2	82.4	93.0
	10	17.9	19.7	21.8	27.0	30.0	33.7	37.6	42.1	47.5	49.5	55.7	63.0	62.4	70.4	79.6	75.6	85.0	95.8
	15	18.2	20.0	22.2	27.4	30.5	34.2	38.2	42.9	48.3	50.3	56.7	64.1	63.5	71.5	80.8	76.8	86.3	97.2
	20	18.4	20.3	22.5	27.9	31.0	34.8	38.9	43.6	49.1	51.2	57.6	65.1	64.5	72.7	82.1	78.0	87.6	98.5
	30	18.8	20.8	23.1	28.6	31.8	35.7	39.9	44.7	50.5	52.6	59.2	66.9	66.3	74.7	84.3	80.2	90.0	101.1
	40	19.1	21.0	23.4	29.0	32.4	36.3	40.6	45.6	51.5	53.7	60.5	68.4	67.8	76.4	86.3	82.0	92.0	103.3
280	0	16.4	18.0	20.0	24.7	27.4	30.7	34.3	38.4	43.2	45.1	50.7	57.3	56.9	64.1	72.6	69.0	77.8	87.9
	10	16.9	18.6	20.6	25.5	28.3	31.7	35.4	39.7	44.7	46.6	52.4	59.3	58.8	66.3	74.9	71.3	80.3	90.6
	15	17.2	18.9	20.9	25.9	28.8	32.2	36.0	40.4	45.5	47.4	53.3	60.3	59.8	67.4	76.2	72.5	81.6	92.0
	20	17.4	19.2	21.3	26.3	29.3	32.8	36.6	41.0	46.2	48.2	54.2	61.2	60.7	68.5	77.3	73.6	82.8	93.3
	30	17.8	19.6	21.8	27.0	30.0	33.6	37.6	42.1	47.5	49.5	55.7	63.0	62.5	70.4	79.5	75.7	85.1	95.8
	40	18.0	19.8	22.0	27.4	30.5	34.2	38.3	42.9	48.4	50.5	56.9	64.4	63.8	72.0	81.3	77.4	87.0	97.9
260	0	15.5	17.0	18.8	23.2	25.8	28.8	32.2	36.0	40.5	42.3	47.5	53.7	53.3	60.0	67.9	64.7	73.0	82.6
	10	15.9	17.5	19.4	24.0	26.6	29.7	33.3	37.2	41.9	43.7	49.1	55.5	55.0	62.0	70.2	66.9	75.4	85.1
	15	16.2	17.8	19.7	24.4	27.0	30.2	33.8	37.8	42.6	44.4	49.9	56.4	56.0	63.1	71.3	68.0	76.6	86.5
	20	16.5	18.1	20.0	24.8	27.5	30.7	34.4	38.5	43.3	45.2	50.8	57.3	56.9	64.1	72.5	69.1	77.8	87.8
	30	16.8	18.5	20.4	25.4	28.2	31.5	35.3	39.5	44.5	46.4	52.2	58.9	58.5	65.9	74.5	71.0	79.9	90.1
	40	17.0	18.7	20.7	25.7	28.6	32.0	35.9	40.2	45.3	47.3	53.3	60.2	59.8	67.4	76.2	72.6	81.8	92.2
240	0	14.6	15.9	17.6	21.8	24.1	26.9	30.1	33.6	37.8	39.4	44.2	49.9	49.6	55.8	63.2	60.3	68.0	76.9
	10	15.0	16.4	18.1	22.5	24.9	27.8	31.1	34.7	39.0	40.7	45.7	51.6	51.2	57.7	65.3	62.3	70.2	79.4
	15	15.2	16.7	18.4	22.8	25.3	28.3	31.6	35.3	39.7	41.4	46.5	52.5	52.1	58.7	66.3	63.3	71.4	80.7
	20	15.5	16.9	18.7	23.2	25.7	28.7	32.1	35.9	40.3	42.1	47.3	53.3	53.0	59.7	67.4	64.4	72.5	81.9
	30	15.8	17.3	19.2	23.7	26.3	29.4	32.9	36.8	41.4	43.2	48.6	54.8	54.4	61.3	69.3	66.2	74.6	84.2
	40	15.9	17.5	19.4	24.1	26.7	29.9	33.5	37.5	42.2	44.1	49.6	56.0	55.6	62.7	70.9	67.7	76.3	86.1
220	0	13.6	14.9	16.4	20.3	22.4	25.0	28.0	31.2	35.0	36.5	40.9	46.1	45.8	51.6	58.3	55.7	62.8	71.1
	10	14.1	15.4	16.9	20.9	23.2	25.8	28.9	32.2	36.1	37.7	42.3	47.7	47.3	53.3	60.2	57.6	64.9	73.4
	15	14.3	15.6	17.2	21.3	23.5	26.2	29.4	32.7	36.7	38.4	43.0	48.5	48.2	54.2	61.2	58.5	66.0	74.6
	20	14.5	15.9	17.5	21.6	23.9	26.7	29.8	33.3	37.3	39.0	43.7	49.3	49.0	55.1	62.2	59.5	67.0	75.8
	30	14.8	16.2	17.9	22.1	24.5	27.3	30.6	34.1	38.3	40.0	44.9	50.6	50.3	56.6	64.0	61.2	68.9	77.9
	40	14.9	16.3	18.1	22.4	24.8	27.7	31.1	34.7	39.0	40.8	45.8	51.7	51.3	57.9	65.4	62.5	70.5	79.7
200	0	12.7	13.9	15.3	18.8	20.8	23.1	25.8	28.7	32.2	33.6	37.5	42.3	42.0	47.2	53.3	51.0	57.4	65.0
	10	13.1	14.3	15.7	19.4	21.4	23.8	26.6	29.6	33.2	34.7	38.8	43.7	43.4	48.8	55.1	52.7	59.4	67.1
	15	13.3	14.5	16.0	19.7	21.8	24.2	27.1	30.1	33.8	35.2	39.5	44.4	44.1	49.6	56.0	53.6	60.4	68.2
	20	13.5	14.8	16.3	20.0	22.1	24.6	27.5	30.6	34.3	35.8	40.1	45.2	44.9	50.4	56.9	54.5	61.3	69.3
	30	13.8	15.1	16.6	20.5	22.6	25.2	28.2	31.4	35.2	36.8	41.2	46.4	46.1	51.8	58.5	56.0	63.1	71.3
	40	13.9	15.2	16.8	20.8	22.9	25.6	28.6	31.9	35.8	37.4	42.0	47.3	47.0	52.9	59.8	57.2	64.5	72.9
180	0	11.8	12.9	14.1	17.4	19.1	21.2	23.6	26.2	29.3	30.6	34.1	38.4	38.1	42.7	48.2	46.1	51.9	58.6
	10	12.2	13.3	14.6	17.9	19.7	21.9	24.4	27.1	30.3	31.6	35.3	39.6	39.3	44.1	49.8	47.6	53.6	60.6
	15	12.4	13.5	14.8	18.2	20.0	22.2	24.8	27.5	30.8	32.1	35.9	40.3	40.0	44.9	50.7	48.5	54.5	61.6
	20	12.6	13.7	15.0	18.5	20.3	22.6	25.2	28.0	31.3	32.6	36.4	41.0	40.7	45.6	51.5	49.2	55.4	62.6
	30	12.8	14.0	15.3	18.9	20.8	23.1	25.8	28.7	32.1	33.5	37.4	42.1	41.8	46.9	52.9	50.6	57.0	64.4
	40	12.9	14.1	15.5	19.1	21.1	23.4	26.2	29.1	32.6	34.0	38.1	42.9	42.6	47.8	54.0	51.7	58.2	65.8

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.
If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	15.6	24.9	34.0	43.2	52.3	61.6	70.9	80.4
	MAX AUTO	6.1	14.4	22.8	31.3	40.0	49.0	58.2	67.7	77.6
	AUTOBRAKE 4	5.9	13.6	21.2	29.1	37.1	45.5	54.2	63.3	73.0
	AUTOBRAKE 3	5.6	12.7	19.7	26.9	34.2	41.9	49.8	58.3	67.3
	AUTOBRAKE 2	5.3	11.8	18.2	24.8	31.5	38.4	45.6	53.3	61.5
	AUTOBRAKE 1	5.2	11.0	16.8	22.8	28.9	35.2	41.9	48.9	56.4

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.8	14.7	23.4	32.0	40.4	48.8	57.2	65.6	74.2
	MAX AUTO	4.3	11.6	18.9	26.4	34.1	42.0	50.2	58.9	68.0
	AUTOBRAKE 4	3.6	9.2	15.0	21.1	27.5	34.4	41.7	49.6	58.2
	AUTOBRAKE 3	2.5	6.6	11.1	15.9	21.0	26.7	32.8	39.5	46.8
	AUTOBRAKE 2	1.4	4.4	7.6	11.3	15.3	19.7	24.5	29.8	35.6
	AUTOBRAKE 1	1.0	3.0	5.3	7.8	10.6	13.9	17.5	21.7	26.4

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

Performance Inflight — Chapter PI
Engine Inoperative — Section 13

ENGINE INOP

Initial Max Continuous EPR
Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20 & ABOVE	1.179	1.161	1.153	1.143	1.130	1.113	1.112	1.110	1.108
15	1.218	1.203	1.183	1.175	1.163	1.145	1.143	1.141	1.139
10	1.257	1.252	1.235	1.206	1.196	1.178	1.176	1.174	1.173
5	1.289	1.296	1.292	1.265	1.230	1.211	1.210	1.208	1.206
0	1.289	1.324	1.340	1.328	1.297	1.266	1.264	1.261	1.258
-5	1.289	1.324	1.365	1.380	1.364	1.340	1.338	1.332	1.327
-10	1.289	1.324	1.365	1.403	1.420	1.406	1.403	1.396	1.389
-15 & BELOW	1.289	1.324	1.365	1.403	1.441	1.439	1.436	1.431	1.426

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off
37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	1.410	1.410	1.410	1.410	1.410	1.379	1.342	1.310	1.276	1.239	1.203	1.174
240	0.74	1.426	1.426	1.426	1.426	1.426	1.426	1.411	1.365	1.312	1.259	1.225	1.190
280	0.86	1.405	1.405	1.405	1.405	1.405	1.405	1.405	1.405	1.381	1.330	1.267	1.208
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	1.415	1.415	1.415	1.415	1.415	1.390	1.355	1.329	1.299	1.260	1.221	1.188
240	0.71	1.405	1.405	1.405	1.405	1.405	1.405	1.393	1.350	1.309	1.267	1.235	1.203
280	0.82	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.422	1.359	1.290	1.231
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.58	1.403	1.403	1.403	1.403	1.403	1.403	1.363	1.331	1.300	1.267	1.234	1.201
240	0.68	1.384	1.384	1.384	1.384	1.384	1.384	1.384	1.353	1.315	1.279	1.245	1.214
280	0.79	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.412	1.361	1.302	1.243
320	0.89	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.293	1.249
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	1.390	1.390	1.390	1.390	1.390	1.375	1.339	1.308	1.277	1.246	1.215	1.185
240	0.66	1.370	1.370	1.370	1.370	1.370	1.370	1.364	1.326	1.289	1.253	1.223	1.194
280	0.76	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.347	1.300	1.251	1.211
320	0.85	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.333	1.288	1.234
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	1.419	1.419	1.419	1.419	1.419	1.390	1.353	1.317	1.283	1.251	1.218	1.201
240	0.63	1.385	1.385	1.385	1.385	1.385	1.385	1.359	1.321	1.282	1.249	1.221	1.192
280	0.73	1.356	1.356	1.356	1.356	1.356	1.356	1.356	1.342	1.303	1.263	1.224	1.195
320	0.82	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.300	1.251	1.202
360	0.91	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.232	1.194
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.51	1.463	1.463	1.463	1.463	1.463	1.457	1.415	1.373	1.332	1.297	1.262	1.228
240	0.60	1.430	1.430	1.430	1.430	1.430	1.430	1.422	1.378	1.334	1.290	1.260	1.231
280	0.70	1.358	1.358	1.358	1.358	1.358	1.358	1.358	1.358	1.326	1.290	1.254	1.223
320	0.79	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.300	1.260	1.221
360	0.88	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.247	1.210

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE ONLY	-0.004	-0.003	-0.003	-0.003	-0.004	-0.005
ENGINE & WING*	-0.015	-0.013	-0.013	-0.012	-0.011	-0.012
ENGINE & WING**	-0.026	-0.024	-0.022	-0.021	-0.020	-0.019

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.49	1.504	1.504	1.504	1.504	1.504	1.480	1.433	1.386	1.343	1.307	1.270	1.242
240	0.58	1.470	1.470	1.470	1.470	1.470	1.470	1.443	1.395	1.347	1.305	1.274	1.243
280	0.67	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.375	1.335	1.296	1.258	1.229
320	0.76	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.313	1.279	1.244	1.209
360	0.85	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.252	1.227	1.193

24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.48	1.502	1.502	1.502	1.502	1.502	1.493	1.447	1.401	1.356	1.320	1.284	1.248
240	0.57	1.474	1.474	1.474	1.474	1.474	1.474	1.462	1.414	1.366	1.319	1.287	1.256
280	0.66	1.398	1.398	1.398	1.398	1.398	1.398	1.398	1.392	1.352	1.312	1.271	1.241
320	0.75	1.318	1.318	1.318	1.318	1.318	1.318	1.318	1.318	1.318	1.288	1.254	1.220
360	0.83	1.255	1.255	1.255	1.255	1.255	1.255	1.255	1.255	1.255	1.255	1.235	1.202

22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.46	1.496	1.496	1.496	1.496	1.496	1.471	1.427	1.384	1.344	1.309	1.274	1.249
240	0.55	1.482	1.482	1.482	1.482	1.482	1.482	1.452	1.405	1.358	1.317	1.284	1.252
280	0.63	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.394	1.350	1.307	1.270	1.241
320	0.72	1.327	1.327	1.327	1.327	1.327	1.327	1.327	1.327	1.312	1.279	1.246	1.213
360	0.80	1.259	1.259	1.259	1.259	1.259	1.259	1.259	1.259	1.259	1.252	1.221	1.189

20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.44	1.486	1.486	1.486	1.486	1.486	1.486	1.448	1.406	1.365	1.330	1.296	1.262
240	0.53	1.492	1.492	1.492	1.492	1.492	1.492	1.491	1.445	1.399	1.353	1.317	1.283
280	0.61	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.440	1.393	1.347	1.300	1.269
320	0.69	1.343	1.343	1.343	1.343	1.343	1.343	1.343	1.343	1.343	1.310	1.276	1.242
360	0.77	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.242	1.211

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.42	1.474	1.474	1.474	1.474	1.474	1.463	1.425	1.387	1.351	1.320	1.289	1.260
240	0.51	1.494	1.494	1.494	1.494	1.494	1.494	1.477	1.434	1.392	1.351	1.318	1.285
280	0.59	1.453	1.453	1.453	1.453	1.453	1.453	1.453	1.431	1.385	1.339	1.298	1.270
320	0.67	1.364	1.364	1.364	1.364	1.364	1.364	1.364	1.364	1.349	1.313	1.277	1.242
360	0.75	1.282	1.282	1.282	1.282	1.282	1.282	1.282	1.282	1.282	1.275	1.245	1.214

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE ONLY	-0.005	-0.006	-0.007	-0.006	-0.010
ENGINE & WING*	-0.012	-0.012	-0.013	-0.012	-0.015
ENGINE & WING**	-0.019	-0.019	-0.019	-0.018	-0.020

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	1.463	1.463	1.463	1.463	1.463	1.463	1.443	1.408	1.372	1.339	1.311	1.283
240	0.49	1.485	1.485	1.485	1.485	1.485	1.485	1.485	1.454	1.414	1.374	1.340	1.310
280	0.57	1.449	1.449	1.449	1.449	1.449	1.449	1.449	1.449	1.412	1.369	1.325	1.293
320	0.64	1.387	1.387	1.387	1.387	1.387	1.387	1.387	1.387	1.387	1.350	1.311	1.272
360	0.72	1.301	1.301	1.301	1.301	1.301	1.301	1.301	1.301	1.301	1.301	1.276	1.246
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
200	0.39	1.444	1.444	1.444	1.444	1.444	1.444	1.413	1.378	1.343	1.315	1.290	1.264
240	0.47	1.455	1.455	1.455	1.455	1.455	1.455	1.451	1.412	1.372	1.333	1.306	1.279
280	0.54	1.438	1.438	1.438	1.438	1.438	1.438	1.438	1.421	1.380	1.339	1.301	1.274
320	0.62	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.364	1.325	1.286	1.249
360	0.69	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.304	1.292	1.261	1.231
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.38	1.430	1.430	1.430	1.430	1.430	1.424	1.390	1.355	1.322	1.298	1.274	1.251
240	0.45	1.434	1.434	1.434	1.434	1.434	1.434	1.413	1.375	1.336	1.303	1.280	1.256
280	0.52	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.391	1.350	1.308	1.278	1.254
320	0.60	1.369	1.369	1.369	1.369	1.369	1.369	1.369	1.369	1.337	1.298	1.258	1.228
360	0.67	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.297	1.272	1.241	1.210
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.36	1.409	1.409	1.409	1.409	1.409	1.409	1.395	1.368	1.341	1.314	1.287	1.261
240	0.43	1.404	1.404	1.404	1.404	1.404	1.404	1.404	1.379	1.351	1.323	1.294	1.266
280	0.51	1.393	1.393	1.393	1.393	1.393	1.393	1.393	1.391	1.362	1.333	1.305	1.274
320	0.58	1.347	1.347	1.347	1.347	1.347	1.347	1.347	1.347	1.341	1.312	1.283	1.253
360	0.65	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.281	1.253	1.226
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
200	0.33	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.364	1.339	1.314	1.291	1.269
240	0.40	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.347	1.323	1.298	1.274	1.252
280	0.46	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.311	1.287	1.263	1.240
320	0.53	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.288	1.270	1.247	1.223
360	0.59	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.251	1.228	1.205

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE ONLY	-0.013	-0.015	-0.015	-0.015	-0.010
ENGINE & WING*	-0.023	-0.023	-0.019	-0.018	-0.012
ENGINE & WING**	-0.021	-0.021	-0.023	-0.021	-0.014

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	16800	15400	13500
280	271	273	18800	17400	15700
260	252	263	20700	19400	17800
240	233	253	22600	21400	20000
220	214	243	24600	23400	22000
200	195	231	26300	25400	24100
180	175	219	28000	27100	26100
160	156	206	29800	28900	28000

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
137	128	119	112	106	100	95	90	86	82	79
273	255	238	224	211	200	190	181	172	165	158
409	381	357	336	317	300	285	271	259	247	237
544	508	476	447	422	400	380	362	345	330	316
679	633	594	559	528	500	475	452	432	413	396
813	759	712	670	633	600	570	543	519	496	476
946	884	829	781	738	700	665	634	605	579	555
1079	1009	947	892	844	800	761	725	692	663	636
1212	1134	1065	1003	949	900	856	816	780	746	716
1345	1258	1182	1114	1054	1000	951	907	867	830	796
1478	1383	1299	1225	1159	1100	1046	998	954	913	876
1610	1507	1417	1336	1264	1200	1142	1089	1041	997	956
1743	1632	1534	1447	1370	1300	1237	1180	1128	1080	1037
1876	1756	1651	1558	1475	1400	1332	1271	1215	1164	1117
2009	1881	1769	1669	1580	1500	1428	1362	1302	1247	1197
2142	2006	1886	1780	1685	1600	1523	1453	1389	1331	1277
2275	2131	2004	1891	1791	1700	1618	1544	1476	1414	1357
2409	2257	2122	2003	1896	1800	1713	1635	1563	1497	1437

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	160	180	200	220	240	260	280	300	
100	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.4	0:16
200	2.3	2.5	2.7	2.8	3.0	3.1	3.2	3.3	0:32
300	3.7	4.0	4.3	4.6	4.9	5.2	5.4	5.7	0:48
400	5.0	5.5	5.9	6.4	6.9	7.3	7.7	8.1	1:04
500	6.3	6.8	7.4	8.1	8.7	9.3	10.0	10.5	1:19
600	7.5	8.2	8.9	9.7	10.5	11.3	12.0	12.8	1:34
700	8.7	9.6	10.4	11.3	12.3	13.2	14.1	15.0	1:49
800	9.9	10.9	11.9	13.0	14.0	15.1	16.1	17.2	2:04
900	11.2	12.3	13.4	14.6	15.8	16.9	18.2	19.4	2:19
1000	12.4	13.6	14.9	16.2	17.5	18.8	20.2	21.5	2:34
1100	13.6	14.9	16.3	17.8	19.2	20.7	22.2	23.7	2:49
1200	14.7	16.3	17.8	19.4	21.0	22.5	24.2	25.8	3:03
1300	15.9	17.6	19.2	20.9	22.7	24.4	26.2	28.0	3:18
1400	17.1	18.9	20.7	22.5	24.4	26.2	28.2	30.1	3:33
1500	18.3	20.2	22.1	24.1	26.1	28.1	30.2	32.2	3:48
1600	19.4	21.5	23.5	25.6	27.8	29.9	32.1	34.3	4:03
1700	20.6	22.8	24.9	27.2	29.4	31.7	34.1	36.4	4:18
1800	21.8	24.0	26.3	28.7	31.1	33.5	36.0	38.5	4:33

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13100	11000	7900
290	13900	11900	9600
280	14700	12800	10600
270	15400	13800	11500
260	16500	15200	13000
250	17600	16300	14600
240	18700	17500	15800
230	19900	18700	17100
220	21000	19900	18300
210	22200	21000	19600
200	23400	22200	20800
190	24700	23500	22100
180	25800	24800	23400
170	26900	25900	24700
160	28000	27000	25900

With engine anti-ice on, decrease altitude capability by 1900 ft.
With engine and wing anti-ice on, decrease altitude capability by 2500 ft.

320 KIAS Altitude Capability

Max Continuous Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13700	11600	9000
290	14500	12500	10300
280	15200	13400	11200
270	15800	14200	12000
260	16300	15000	12800
250	16900	15500	13600
240	17400	16100	14300
230	17900	16600	15000
220	18400	17100	15500
210	18800	17600	16000
200	19200	18000	16500
190	19600	18400	17000
180	20000	18800	17400
170	20300	19200	17700
160	20600	19500	18100
150	21000	19800	18400
140	21300	20000	18700

With engine anti-ice on, decrease altitude capability by 1800 ft.
With engine and wing anti-ice on, decrease altitude capability by 2300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
300	EPR	1.259	1.366						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	8919	9092						
280	EPR	1.236	1.333						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	8548	8681						
260	EPR	1.213	1.297	1.341					
	MACH	.577	.627	.651					
	KIAS	321	318	318					
	FF/ENG	8069	8080	8152					
240	EPR	1.188	1.260	1.298	1.344				
	MACH	.558	.606	.627	.652				
	KIAS	310	307	306	306				
	FF/ENG	7412	7389	7412	7482				
220	EPR	1.164	1.226	1.258	1.297	1.343			
	MACH	.538	.585	.605	.626	.651			
	KIAS	298	296	294	294	294			
	FF/ENG	6764	6736	6728	6748	6810			
200	EPR	1.141	1.195	1.223	1.254	1.293	1.339		
	MACH	.516	.562	.581	.601	.623	.648		
	KIAS	286	284	283	282	281	281		
	FF/ENG	6126	6094	6085	6077	6089	6140		
180	EPR	1.119	1.166	1.189	1.217	1.247	1.284	1.330	
	MACH	.492	.537	.556	.576	.596	.617	.642	
	KIAS	272	271	270	269	268	267	267	
	FF/ENG	5490	5462	5451	5443	5434	5438	5475	
160	EPR	1.098	1.139	1.158	1.181	1.207	1.237	1.272	1.316
	MACH	.466	.510	.529	.548	.568	.588	.609	.633
	KIAS	258	257	256	256	255	254	253	252
	FF/ENG	4862	4838	4827	4817	4809	4800	4796	4817

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
287	264	244	227	213	200	191	182	174	167	160
576	530	489	455	426	400	381	364	348	334	321
865	796	735	684	640	600	572	546	522	501	482
1156	1064	982	913	853	800	763	729	698	669	643
1448	1332	1229	1142	1067	1000	953	910	871	835	803
1742	1602	1477	1372	1281	1200	1144	1092	1045	1002	963
2036	1871	1725	1602	1495	1400	1335	1274	1219	1168	1122
2332	2141	1973	1831	1709	1600	1525	1456	1392	1334	1282
2629	2414	2223	2062	1924	1800	1715	1637	1565	1500	1441

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.4	0:40	3.0	0:38	2.6	0:37	2.4	0:36	2.1	0:34
400	7.1	1:17	6.5	1:13	6.0	1:10	5.5	1:07	5.2	1:03
600	10.9	1:54	10.0	1:48	9.3	1:43	8.7	1:38	8.2	1:33
800	14.5	2:31	13.5	2:24	12.6	2:17	11.8	2:10	11.2	2:02
1000	18.2	3:09	16.9	2:59	15.8	2:51	14.9	2:42	14.2	2:32
1200	21.8	3:47	20.3	3:35	19.1	3:25	17.9	3:14	17.1	3:02
1400	25.3	4:26	23.7	4:12	22.2	3:59	20.9	3:47	20.0	3:33
1600	28.8	5:05	27.0	4:48	25.4	4:33	23.9	4:19	22.9	4:03
1800	32.3	5:44	30.3	5:25	28.5	5:08	26.9	4:52	25.7	4:34

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	-0.1	-0.1	0.0	0.1	0.3	0.4	0.6	0.7
4	-0.4	-0.2	0.0	0.4	0.7	1.1	1.5	1.9
6	-0.6	-0.3	0.0	0.6	1.2	1.8	2.4	3.1
8	-0.9	-0.4	0.0	0.8	1.6	2.5	3.4	4.3
10	-1.1	-0.5	0.0	1.0	2.1	3.2	4.3	5.4
12	-1.3	-0.7	0.0	1.2	2.5	3.8	5.2	6.6
14	-1.6	-0.8	0.0	1.4	2.9	4.5	6.1	7.7
16	-1.8	-0.9	0.0	1.6	3.3	5.1	6.9	8.8
18	-2.0	-1.0	0.0	1.8	3.7	5.7	7.8	10.0
20	-2.3	-1.1	0.0	2.0	4.1	6.3	8.6	11.1
22	-2.5	-1.2	0.0	2.2	4.5	6.9	9.5	12.1
24	-2.8	-1.4	0.0	2.4	4.9	7.5	10.3	13.2
26	-3.0	-1.5	0.0	2.5	5.2	8.1	11.1	14.3
28	-3.2	-1.6	0.0	2.7	5.6	8.7	11.9	15.4
30	-3.5	-1.7	0.0	2.9	5.9	9.2	12.7	16.4
32	-3.7	-1.8	0.0	3.0	6.2	9.7	13.5	17.4
34	-3.9	-2.0	0.0	3.1	6.6	10.3	14.2	18.5

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
277	257	240	225	212	200	191	182	174	167	161
551	513	479	449	423	400	382	366	351	337	324
826	769	718	674	635	600	574	550	527	506	487
1100	1025	957	898	847	800	765	732	702	675	650
1375	1280	1196	1123	1058	1000	957	916	879	844	813
1650	1537	1435	1348	1270	1200	1148	1099	1054	1013	976
1924	1792	1674	1572	1482	1400	1339	1283	1230	1183	1139
2199	2049	1914	1797	1693	1600	1530	1466	1406	1351	1301
2474	2305	2153	2021	1905	1800	1722	1649	1582	1520	1464

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		18		22	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.5	0:37	3.1	0:36	2.7	0:34	2.5	0:33
400	7.5	1:09	6.8	1:06	6.3	1:03	5.9	1:01
600	11.5	1:42	10.6	1:37	9.9	1:33	9.4	1:28
800	15.4	2:15	14.3	2:08	13.4	2:02	12.8	1:55
1000	19.3	2:47	18.0	2:39	16.9	2:31	16.2	2:23
1200	23.2	3:20	21.7	3:10	20.4	3:00	19.6	2:50
1400	27.0	3:52	25.3	3:40	23.9	3:29	22.9	3:18
1600	30.9	4:25	29.0	4:11	27.4	3:58	26.3	3:45
1800	34.7	4:58	32.6	4:42	30.8	4:27	29.6	4:12

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3
4	-0.1	-0.1	0.0	0.1	0.3	0.4	0.7	1.0
6	-0.2	-0.1	0.0	0.2	0.4	0.8	1.1	1.6
8	-0.3	-0.2	0.0	0.3	0.6	1.0	1.6	2.2
10	-0.4	-0.2	0.0	0.4	0.8	1.3	2.0	2.8
12	-0.5	-0.3	0.0	0.4	1.0	1.6	2.4	3.4
14	-0.6	-0.3	0.0	0.5	1.2	1.9	2.8	4.0
16	-0.7	-0.4	0.0	0.6	1.3	2.2	3.3	4.6
18	-0.8	-0.4	0.0	0.7	1.5	2.5	3.6	5.1
20	-0.9	-0.5	0.0	0.7	1.7	2.7	4.0	5.6
22	-1.0	-0.5	0.0	0.8	1.8	3.0	4.4	6.1
24	-1.1	-0.6	0.0	0.9	2.0	3.2	4.8	6.6
26	-1.1	-0.6	0.0	0.9	2.1	3.5	5.1	7.1
28	-1.2	-0.7	0.0	1.0	2.3	3.7	5.5	7.6
30	-1.3	-0.7	0.0	1.1	2.4	4.0	5.8	8.1
32	-1.4	-0.8	0.0	1.1	2.6	4.2	6.2	8.5
34	-1.4	-0.8	0.0	1.2	2.7	4.4	6.5	9.0

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
300	EPR	1.163	1.200	1.271	1.363			
	KIAS	260	260	262	277			
	FF/ENG	8080	8090	8160	8510			
280	EPR	1.147	1.179	1.242	1.327			
	KIAS	251	251	253	261			
	FF/ENG	7480	7480	7530	7730			
260	EPR	1.131	1.159	1.215	1.294	1.401		
	KIAS	242	242	243	246	266		
	FF/ENG	6890	6900	6910	7010	7430		
240	EPR	1.116	1.141	1.189	1.259	1.352		
	KIAS	232	233	234	235	247		
	FF/ENG	6310	6310	6320	6370	6620		
220	EPR	1.101	1.124	1.165	1.225	1.310	1.437	
	KIAS	223	223	224	224	230	251	
	FF/ENG	5760	5740	5740	5760	5880	6350	
200	EPR	1.087	1.105	1.141	1.192	1.268	1.370	
	KIAS	216	216	216	216	216	229	
	FF/ENG	5240	5200	5190	5190	5240	5480	
180	EPR	1.074	1.089	1.119	1.161	1.224	1.316	
	KIAS	209	209	209	209	209	209	
	FF/ENG	4850	4690	4660	4660	4680	4750	
160	EPR	1.062	1.075	1.097	1.133	1.184	1.260	1.371
	KIAS	202	202	202	202	202	202	206
	FF/ENG	4350	4300	4150	4150	4140	4170	4300
140	EPR	1.049	1.060	1.079	1.107	1.148	1.210	1.297
	KIAS	194	194	194	194	194	194	194
	FF/ENG	3860	3810	3660	3690	3680	3640	3690

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	530	390				
50	580	440	300			
48	630	480	340			
46	670	530	380	250		
44	710	580	430	300		
42	740	630	480	350	200	
40	780	680	530	390	240	
38	820	730	580	430	280	130
36	860	780	620	470	320	170
34	900	820	660	510	360	210
32	900	860	710	550	400	250
30	910	910	750	590	430	280
20	920	920	840	740	580	430
10	940	940	860	750	640	500
0	960	960	880	770	660	540
-20	1000	1000	910	800	680	570
-40	1050	1050	960	840	720	590

Rate of climb capability shown is valid for 180000 kg, gear down at VREF20 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 180000 kg.
Increase rate of climb 60 ft/min per 5000 kg less than 180000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	60	-80				
50	110	-30	-170			
48	150	10	-130			
46	190	50	-90	-230		
44	220	100	-50	-180		
42	250	140	-10	-140	-290	
40	290	190	40	-100	-260	
38	330	230	80	-70	-220	-370
36	360	270	120	-30	-180	-330
34	390	310	160	0	-150	-300
32	400	350	190	40	-120	-270
30	400	390	230	70	-80	-240
20	410	390	310	200	40	-110
10	410	400	320	200	90	-50
0	420	410	320	210	100	-20
-20	440	430	340	220	100	-20
-40	460	450	360	230	110	-20

Rate of climb capability shown is valid for 180000 kg, gear down at VREF30 + 5.
Decrease rate of climb 50 ft/min per 5000 kg greater than 180000 kg.
Increase rate of climb 70 ft/min per 5000 kg less than 180000 kg.

ALTERNATE MODE EEC

Limit Weight

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 KG)									
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 KG)									
	140	160	180	200	220	240	260	280	300	320
FIELD	134.1	153.6	173.0	192.4	211.9	231.3	250.7	270.1	289.6	309.0
CLIMB	128.1	146.5	164.9	183.2	201.6	219.9	238.3	256.7	275.0	293.4
OBSTACLE	133.3	151.2	169.0	186.9	204.7	222.5	240.3	258.2	276.0	293.8
NET LEVEL OFF WEIGHT	132.5	150.2	167.8	185.5	203.2	220.8	238.5	256.2	273.8	291.5
LANDING CLIMB	121.6	141.4	161.2	181.0	200.8	220.6	240.4	260.2	280.0	299.8

Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
V1	+2
VR	+1
V2	0

Max Takeoff %N1

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	90.2	90.1	90.3	90.4	90.5	90.6	90.6	90.7	90.6	90.6	90.6
50	122	91.5	91.3	91.3	91.2	91.2	91.3	91.4	91.5	91.5	91.5	91.5
45	113	92.2	92.5	92.4	92.1	92.2	92.2	92.0	92.1	92.1	92.2	92.2
40	104	92.7	93.5	93.4	93.3	93.2	93.2	93.1	93.0	92.8	92.8	92.8
35	95	93.1	94.2	94.2	94.1	94.0	94.0	93.9	93.8	93.8	93.6	93.6
30	86	92.6	94.9	94.9	94.9	94.8	94.8	94.7	94.6	94.6	94.5	94.4
25	77	91.9	94.1	94.8	95.4	95.6	95.5	95.4	95.4	95.4	95.3	95.2
20	68	91.1	93.3	94.0	94.6	95.2	95.7	95.9	95.7	95.7	95.9	95.9
15	59	90.3	92.5	93.2	93.8	94.3	94.8	95.6	95.8	95.8	95.8	95.8
10	50	89.5	91.7	92.4	93.0	93.5	94.0	94.8	95.3	95.6	95.7	95.7
5	41	88.7	90.9	91.5	92.2	92.7	93.2	93.9	94.4	94.9	95.5	95.5
0	32	87.9	90.1	90.7	91.3	91.9	92.3	93.1	93.6	94.0	94.7	94.8
-10	14	86.3	88.4	89.0	89.6	90.2	90.6	91.3	91.9	92.3	93.0	93.1
-20	-4	84.6	86.7	87.3	87.9	88.4	88.9	89.6	90.1	90.5	91.2	91.3
-30	-22	82.9	85.0	85.6	86.2	86.7	87.1	87.8	88.3	88.7	89.4	89.5
-40	-40	81.2	83.2	83.8	84.4	84.9	85.3	86.0	86.5	86.8	87.5	87.6
-50	-58	79.5	81.4	82.0	82.5	83.0	83.5	84.1	84.6	85.0	85.6	85.7

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
PACKS OFF	0.1	0.1	0.1	0.2	0.2	0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3

ALTERNATE MODE EEC

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT) / SPEED (KIAS OR MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
	310	310	310	310	310	310	310	.84	.84	.84
60	81.8	82.5	84.4	87.0	89.7	91.0	91.9	93.5	93.3	93.1
50	83.2	83.8	84.4	85.7	88.4	89.7	90.5	92.1	91.9	91.7
40	84.5	85.1	85.6	86.5	87.4	88.3	89.1	90.7	90.4	90.3
30	83.6	86.4	87.0	87.7	88.6	88.4	88.0	89.2	89.0	88.8
20	82.2	85.0	87.4	88.8	89.7	89.4	89.2	88.4	87.5	87.4
15	81.5	84.2	86.7	89.2	90.1	89.9	89.7	89.0	88.1	88.0
10	80.8	83.5	85.9	88.5	90.6	90.4	90.7	89.5	88.7	88.6
5	80.1	82.7	85.2	87.7	90.1	90.9	91.7	89.8	89.2	89.1
0	79.4	82.0	84.4	86.9	89.3	90.7	92.4	91.2	90.1	89.9
-5	78.7	81.2	83.6	86.1	88.4	89.9	92.3	92.4	91.5	91.2
-10	77.9	80.5	82.8	85.3	87.6	89.0	91.5	93.3	92.6	92.3
-15	77.2	79.7	82.0	84.5	86.8	88.2	90.6	93.0	92.8	92.6
-20	76.4	78.9	81.2	83.6	85.9	87.3	89.7	92.1	91.9	91.7
-25	75.7	78.2	80.4	82.8	85.1	86.4	88.8	91.2	91.0	90.8
-30	74.9	77.4	79.6	82.0	84.2	85.6	87.9	90.3	90.1	89.9
-35	74.1	76.6	78.8	81.1	83.3	84.7	87.0	89.4	89.2	88.9
-40	73.3	75.8	78.0	80.3	82.5	83.8	86.1	88.4	88.2	88.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.5	-0.5	-0.8	-0.6	-0.2	-0.2	-0.1	-0.1	-0.1	-0.2
ENGINE & WING ANTI-ICE ON	-0.6	-0.6	-0.9	-0.9	-0.5	-0.5	-0.4	-0.5	-0.6	-0.7

Max Cruise %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	87.2	87.0	87.3	87.8	87.8	87.8	87.8	87.8	87.8	87.8
20	87.7	87.4	87.5	87.7	87.5	87.1	87.0	87.0	87.0	87.0
15	88.2	88.0	88.0	88.1	87.8	87.3	86.7	86.7	86.7	86.6
10	88.7	88.7	89.1	89.2	88.2	87.9	87.2	87.1	87.0	86.9
5	89.1	89.2	89.8	90.2	89.4	88.3	87.6	87.6	87.5	87.4
0	88.9	89.5	90.3	90.7	90.4	89.5	88.6	88.6	88.5	88.4
-5	88.0	88.7	89.8	90.5	90.9	90.5	89.9	89.8	89.7	89.5
-10	87.2	87.8	89.0	89.7	90.7	91.1	90.8	90.7	90.5	90.3
-15	86.4	87.0	88.2	88.8	89.8	90.9	90.8	90.7	90.6	90.5
-20	85.6	86.1	87.3	88.0	89.0	90.0	89.9	89.9	89.7	89.6
-25	84.7	85.3	86.4	87.1	88.1	89.1	89.0	89.0	88.8	88.7
-30	83.8	84.4	85.6	86.2	87.2	88.2	88.1	88.1	87.9	87.8
-35	83.0	83.5	84.7	85.3	86.3	87.3	87.2	87.1	87.0	86.9

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)				
	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING ANTI-ICE ON	-0.3	-0.4	-0.4	-0.5	-0.5

ALTERNATE MODE EEC

Go-Around %N1

Based on engine bleed for packs on, engine anti-ice on or off, wing anti-ice off

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	91.0	90.8	90.7	90.7	90.8	90.9	91.1	91.1	91.2	91.3	91.3	91.4
46	115	50	91.9	91.9	91.8	91.6	91.7	91.7	91.7	91.8	91.9	91.9	92.1	92.1
41	106	45	92.5	93.0	92.9	92.9	92.8	92.9	92.7	92.6	92.5	92.6	92.7	92.8
36	97	40	93.0	94.0	93.9	93.9	93.8	93.7	93.7	93.6	93.5	93.4	93.3	93.4
31	88	35	92.8	94.7	94.7	94.7	94.6	94.5	94.5	94.4	94.4	94.3	94.1	94.0
26	79	30	92.1	94.3	95.0	95.6	95.4	95.3	95.2	95.2	95.2	95.1	94.9	94.7
21	70	25	91.3	93.6	94.2	94.9	95.4	95.9	95.8	95.6	95.7	95.9	95.7	95.4
17	62	20	90.5	92.8	93.4	94.1	94.6	95.1	95.6	95.8	95.8	95.8	95.8	95.7
12	53	15	89.8	92.0	92.6	93.3	93.8	94.3	94.8	95.5	95.8	95.7	95.7	95.7
7	45	10	89.0	91.2	91.8	92.5	93.0	93.5	94.0	94.7	95.1	95.6	95.7	95.7
2	36	5	88.2	90.4	91.0	91.7	92.1	92.6	93.2	93.8	94.3	95.1	95.6	95.8
-3	27	0	87.4	89.5	90.2	90.8	91.3	91.8	92.3	93.0	93.4	94.2	94.7	95.2
-13	9	-10	85.8	87.9	88.5	89.1	89.6	90.1	90.6	91.3	91.7	92.5	93.0	93.4
-23	-9	-20	84.1	86.2	86.8	87.4	87.9	88.4	88.9	89.5	90.0	90.7	91.2	91.6
-33	-27	-30	82.5	84.5	85.1	85.7	86.2	86.6	87.1	87.7	88.2	88.9	89.4	89.8
-43	-45	-40	80.7	82.7	83.3	83.9	84.4	84.8	85.3	85.9	86.3	87.1	87.5	87.9
-53	-63	-50	79.0	80.9	81.5	82.1	82.5	83.0	83.5	84.0	84.5	85.2	85.6	86.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.1	0.1	0.1	0.2	0.2	0.2	0.2
1 PACK ON	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3

Intentionally
Blank

ALTERNATE MODE EEC
ENGINE INOP

Initial Max Continuous %N1
Based on .84M, engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	90.4	89.6	89.4	88.9	88.4	87.6	87.5	87.4	87.4
15	91.1	90.6	89.8	89.4	89.0	88.2	88.2	88.1	88.0
10	91.6	91.4	90.8	89.9	89.5	88.8	88.7	88.7	88.6
5	91.7	92.0	91.8	91.0	89.8	89.2	89.2	89.1	89.1
0	90.9	92.0	92.5	92.1	91.2	90.2	90.1	90.0	89.9
-5	90.1	91.1	92.4	92.9	92.4	91.6	91.6	91.4	91.2
-10	89.2	90.3	91.5	92.7	93.3	92.8	92.7	92.5	92.3
-15	88.4	89.4	90.7	91.8	93.0	93.0	92.9	92.7	92.6
-20	87.5	88.5	89.8	91.0	92.1	92.1	92.0	91.8	91.7
-25	86.6	87.7	88.9	90.1	91.2	91.2	91.1	90.9	90.8
-30	85.8	86.8	88.0	89.1	90.3	90.3	90.2	90.0	89.9
-35	84.9	85.9	87.1	88.2	89.4	89.3	89.2	89.1	88.9
-40	84.0	85.0	86.2	87.3	88.4	88.4	88.3	88.1	88.0

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.4	-0.3	-0.4	-0.4	-0.4	-0.5	-0.5	-0.6	-0.6
ENGINE & WING**	-0.6	-0.6	-0.7	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

320 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
30	91.0	92.9	92.7	92.5	92.4	91.6	90.8	90.1	89.4	89.2	88.6	88.4	88.3
25	90.2	93.3	93.5	93.3	93.1	92.3	91.2	90.5	89.9	89.7	89.2	89.0	88.9
20	89.5	92.9	94.1	94.1	93.8	92.9	91.8	91.1	90.4	90.2	89.7	89.5	89.5
15	88.7	92.1	93.3	94.0	94.5	93.5	92.2	91.5	91.0	90.8	90.4	90.2	89.9
10	87.9	91.3	92.4	93.1	93.7	93.3	92.6	91.9	91.4	91.2	91.0	91.2	90.9
5	87.2	90.5	91.6	92.3	92.8	92.5	91.8	91.7	91.8	91.7	91.6	91.9	91.7
0	86.4	89.6	90.8	91.5	92.0	91.7	91.0	90.9	90.9	91.0	91.5	92.4	92.2
-5	85.6	88.8	90.0	90.6	91.1	90.8	90.2	90.0	90.1	90.2	90.7	91.5	91.8
-10	84.8	88.0	89.1	89.8	90.3	90.0	89.3	89.2	89.2	89.3	89.8	90.7	91.0
-15	84.0	87.1	88.3	88.9	89.4	89.1	88.5	88.3	88.4	88.5	89.0	89.8	90.1
-20	83.2	86.3	87.4	88.1	88.6	88.2	87.6	87.5	87.5	87.6	88.1	88.9	89.2
-25	82.3	85.4	86.5	87.2	87.7	87.4	86.7	86.6	86.7	86.8	87.2	88.0	88.3
-30	81.5	84.6	85.7	86.3	86.8	86.5	85.9	85.7	85.8	85.9	86.4	87.2	87.4
-35	80.7	83.7	84.8	85.4	85.9	85.6	85.0	84.8	84.9	85.0	85.5	86.2	86.5
-40	79.8	82.8	83.9	84.5	85.0	84.7	84.1	83.9	84.0	84.1	84.6	85.3	85.6

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
ENGINE ONLY	-0.4	-0.6	-0.6	-0.6	-0.5	-0.4	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.7	-0.7	-0.7	-0.7	-0.6	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING**	-0.6	-0.8	-0.9	-0.9	-0.9	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

280 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
30	90.8	92.6	91.8	91.8	91.9	91.3	90.4	89.5	88.6	88.2	87.7	87.5	87.9
25	90.6	93.1	92.8	92.7	92.5	91.8	90.9	90.1	89.3	89.0	87.9	87.1	87.1
20	89.8	93.5	93.7	93.6	93.5	92.6	91.4	90.6	89.9	89.5	88.5	87.7	87.6
15	89.1	92.8	94.3	94.7	94.5	93.7	92.5	91.2	90.3	90.0	89.0	88.3	88.2
10	88.3	92.0	93.5	94.5	95.5	94.8	93.5	92.1	91.1	90.7	89.5	88.7	88.7
5	87.5	91.2	92.6	93.6	94.7	95.1	94.7	93.0	91.8	91.3	90.1	89.4	89.4
0	86.7	90.4	91.8	92.8	93.8	94.2	94.0	93.3	92.6	92.0	90.6	90.0	90.3
-5	85.9	89.6	91.0	91.9	93.0	93.3	93.2	92.5	92.0	91.8	91.0	90.6	91.1
-10	85.1	88.7	90.1	91.1	92.1	92.5	92.3	91.6	91.1	90.9	90.1	90.3	91.6
-15	84.3	87.9	89.2	90.2	91.2	91.6	91.4	90.7	90.2	90.1	89.2	89.5	90.7
-20	83.5	87.0	88.4	89.3	90.3	90.7	90.5	89.8	89.4	89.2	88.4	88.6	89.8
-25	82.7	86.2	87.5	88.4	89.4	89.8	89.6	89.0	88.5	88.3	87.5	87.7	88.9
-30	81.8	85.3	86.6	87.5	88.5	88.9	88.7	88.1	87.6	87.4	86.6	86.8	88.0
-35	81.0	84.4	85.7	86.6	87.6	88.0	87.8	87.1	86.7	86.5	85.7	85.9	87.1
-40	80.1	83.5	84.8	85.7	86.7	87.0	86.9	86.2	85.8	85.6	84.8	85.0	86.2

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
ENGINE ONLY	-0.4	-0.6	-0.6	-0.6	-0.5	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1
ENGINE & WING*	-0.5	-0.7	-0.8	-0.8	-0.8	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.4	-0.5
ENGINE & WING**	-0.6	-0.8	-1.0	-1.0	-1.0	-0.9	-0.7	-0.8	-0.7	-0.7	-0.7	-0.8	-0.8

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off
240 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
30	90.3	90.9	90.2	90.7	91.1	90.4	88.9	88.4	88.4	88.4	87.8	87.1	87.1
25	90.8	91.5	91.0	91.1	91.7	91.2	89.9	88.8	87.9	87.7	87.0	86.4	86.4
20	90.2	91.9	92.0	92.1	92.4	91.8	90.7	89.6	88.7	88.3	86.8	85.7	85.6
15	89.4	92.2	92.9	93.0	93.3	92.7	91.4	90.3	89.4	89.0	87.5	86.2	85.4
10	88.6	91.4	93.0	94.0	94.3	93.8	92.5	91.2	89.9	89.5	88.1	86.8	86.1
5	87.8	90.6	92.2	93.4	95.1	95.0	93.8	92.3	91.0	90.4	88.6	87.3	86.7
0	87.1	89.8	91.3	92.5	94.2	95.1	95.1	93.6	92.2	91.5	89.5	87.9	87.2
-5	86.3	88.9	90.5	91.7	93.3	94.2	94.4	94.2	93.5	92.8	90.3	88.5	87.7
-10	85.4	88.1	89.6	90.8	92.5	93.4	93.5	93.3	93.1	93.1	91.3	89.1	88.2
-15	84.6	87.3	88.8	90.0	91.6	92.5	92.6	92.4	92.3	92.2	90.6	89.3	88.8
-20	83.8	86.4	87.9	89.1	90.7	91.6	91.7	91.5	91.4	91.3	89.7	88.4	88.2
-25	83.0	85.6	87.1	88.2	89.8	90.7	90.8	90.6	90.5	90.4	88.9	87.5	87.4
-30	82.1	84.7	86.2	87.3	88.9	89.7	89.9	89.7	89.5	89.5	88.0	86.6	86.5
-35	81.3	83.8	85.3	86.4	88.0	88.8	88.9	88.8	88.6	88.6	87.0	85.8	85.6
-40	80.4	82.9	84.4	85.5	87.0	87.9	88.0	87.8	87.7	87.6	86.1	84.8	84.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
ENGINE ONLY	-0.5	-0.6	-0.6	-0.7	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1
ENGINE & WING*	-0.6	-0.8	-0.8	-0.9	-0.8	-0.7	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5
ENGINE & WING**	-0.7	-0.9	-1.0	-1.0	-1.1	-0.9	-0.8	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

200 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
30	90.2	89.3	88.6	88.4	88.2	87.4	87.3	87.5	87.7	87.8	87.1	86.4	86.0
25	90.7	90.0	89.1	89.0	89.0	88.3	87.1	86.8	87.0	87.0	86.4	85.7	85.3
20	90.8	90.6	90.1	89.7	89.6	89.1	88.2	87.3	86.3	86.3	85.6	85.0	84.6
15	90.0	91.0	90.8	90.5	90.3	89.8	89.0	88.3	87.4	87.0	85.2	84.3	83.9
10	89.2	90.8	91.6	91.3	91.1	90.6	89.8	89.1	88.4	88.0	86.2	84.4	83.1
5	88.4	90.0	91.1	91.8	91.9	91.5	90.8	90.0	89.1	88.7	87.2	85.4	84.0
0	87.6	89.2	90.2	91.0	92.0	92.4	91.8	91.1	90.2	89.7	87.8	86.1	84.8
-5	86.8	88.4	89.4	90.2	91.1	92.0	92.7	92.3	91.4	90.9	88.7	86.8	85.5
-10	86.0	87.5	88.6	89.3	90.3	91.1	91.9	92.6	92.7	92.2	89.6	87.4	86.0
-15	85.2	86.7	87.7	88.5	89.4	90.2	91.0	91.7	92.3	92.5	90.6	88.1	86.4
-20	84.4	85.9	86.9	87.6	88.5	89.3	90.1	90.8	91.4	91.6	90.1	88.4	87.0
-25	83.5	85.0	86.0	86.7	87.7	88.5	89.2	89.9	90.5	90.7	89.2	87.5	86.7
-30	82.7	84.1	85.1	85.8	86.8	87.6	88.3	89.0	89.6	89.8	88.3	86.6	85.8
-35	81.8	83.3	84.3	85.0	85.9	86.7	87.4	88.1	88.6	88.9	87.4	85.8	84.9
-40	81.0	82.4	83.4	84.1	85.0	85.7	86.5	87.1	87.7	87.9	86.4	84.8	84.0

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)												
	5	10	12	14	16	18	20	22	24	25	27	29	31
ENGINE ONLY	-0.4	-0.7	-0.6	-0.6	-0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1
ENGINE & WING*	-0.5	-0.8	-0.8	-0.8	-0.8	-0.7	-0.6	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5
ENGINE & WING**	-0.6	-0.9	-1.0	-1.0	-1.0	-0.9	-0.8	-0.9	-0.9	-0.9	-0.9	-0.9	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

Driftdown Speed/Level Off Altitude - Alt Mode

100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE FT		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	281	15000	12500	10300
280	271	272	17200	15400	12900
260	252	263	19400	17600	15700
240	233	253	21400	20000	18100
220	214	243	23400	22000	20400
200	195	232	25400	24200	22500
180	175	220	27000	26000	24800
160	155	207	28700	27800	26800

ALTERNATE MODE EEC
ENGINE INOP

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	8600	4100	
290	10200	6200	300
280	11500	8100	3000
270	12600	9700	4900
260	14400	11600	8200
250	15800	13600	10700
240	17000	15300	12000
230	18300	16600	14300
220	19600	18000	16000
210	20800	19300	17400
200	22000	20600	18800
190	23300	21900	20300
180	24600	23200	21500
170	25700	24600	22900
160	26800	25700	24300

GEAR DOWN

220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	1.160	1.158	1.178	1.180	1.184	1.188	1.196	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
50	1.175	1.170	1.178	1.180	1.184	1.188	1.196	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
45	1.190	1.187	1.178	1.180	1.184	1.188	1.196	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
40	1.207	1.204	1.198	1.187	1.184	1.188	1.196	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
35	1.226	1.223	1.218	1.208	1.199	1.189	1.196	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
30	1.240	1.245	1.239	1.230	1.221	1.212	1.205	1.204	1.211	1.217	1.212	1.195	1.178	1.170	1.172
25	1.240	1.268	1.262	1.252	1.243	1.236	1.230	1.224	1.215	1.217	1.212	1.195	1.178	1.170	1.172
20	1.240	1.279	1.286	1.276	1.267	1.260	1.254	1.249	1.242	1.232	1.212	1.195	1.178	1.170	1.172
15	1.240	1.279	1.311	1.300	1.293	1.285	1.279	1.274	1.268	1.260	1.240	1.207	1.178	1.170	1.172
10	1.240	1.279	1.316	1.324	1.319	1.311	1.307	1.302	1.295	1.287	1.268	1.236	1.203	1.181	1.172
5	1.240	1.279	1.316	1.324	1.335	1.340	1.335	1.332	1.326	1.317	1.297	1.265	1.232	1.212	1.201
0	1.240	1.279	1.316	1.324	1.335	1.347	1.363	1.363	1.357	1.350	1.329	1.295	1.261	1.243	1.235
-5	1.240	1.279	1.316	1.324	1.335	1.347	1.363	1.380	1.391	1.383	1.363	1.329	1.293	1.274	1.269
-10	1.240	1.279	1.316	1.324	1.335	1.347	1.363	1.380	1.396	1.410	1.398	1.363	1.328	1.308	1.302
-15	1.240	1.279	1.316	1.324	1.335	1.347	1.363	1.380	1.396	1.410	1.411	1.399	1.365	1.342	1.335
-20	1.240	1.279	1.316	1.324	1.335	1.347	1.363	1.380	1.396	1.410	1.411	1.399	1.386	1.382	1.372

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003
ENGINE AND WING*	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013
ENGINE AND WING**	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.024

***Wing anti-ice on, packs on.**
****Wing anti-ice on, single bleed source and both packs off.**

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	8300	4900	1200
290	10000	6700	3200
280	11700	8900	5400
270	13400	10800	7800
260	15100	12500	10000
250	16900	14300	11800
240	18700	16100	13600
230	20500	18000	15500
220	22000	19900	17400
210	23600	21600	19500
200	25100	23400	21300
190	26200	25100	23100
180	27200	26100	25000
170	28400	27200	26100
160	29500	28400	27300
150	30800	29600	28600
140	32800	30900	29900

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
260	EPR	1.192	1.261								
	MACH	.458	.501								
	KIAS	253	252								
	FF/ENG	6367	6344								
240	EPR	1.169	1.231	1.261	1.296						
	MACH	.441	.484	.501	.520						
	KIAS	244	243	243	242						
	FF/ENG	5839	5818	5811	5829						
220	EPR	1.147	1.202	1.229	1.259	1.295	1.339				
	MACH	.422	.465	.482	.500	.519	.541				
	KIAS	233	234	233	233	232	232				
	FF/ENG	5304	5300	5291	5283	5299	5356				
200	EPR	1.127	1.174	1.197	1.224	1.255	1.290	1.334			
	MACH	.402	.445	.462	.480	.498	.517	.538			
	KIAS	222	223	223	223	222	222	222			
	FF/ENG	4772	4784	4779	4771	4763	4773	4820			
180	EPR	1.110	1.147	1.167	1.190	1.218	1.247	1.281	1.324		
	MACH	.387	.422	.439	.457	.475	.493	.512	.534		
	KIAS	213	212	212	212	212	211	211	211		
	FF/ENG	4327	4262	4268	4264	4257	4249	4252	4286		
160	EPR	1.094	1.125	1.141	1.160	1.185	1.211	1.240	1.275	1.317	
	MACH	.372	.403	.419	.436	.454	.472	.492	.513	.535	
	KIAS	205	202	202	202	202	202	202	202	202	
	FF/ENG	3925	3818	3812	3805	3799	3797	3802	3815	3845	
140	EPR	1.079	1.106	1.120	1.136	1.157	1.180	1.205	1.233	1.267	1.308
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515	.537
	KIAS	194	194	194	194	194	194	194	194	194	194
	FF/ENG	3474	3496	3491	3486	3475	3468	3407	3409	3419	3444

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
324	290	260	236	217	200	189	179	170	161	154
656	584	523	474	435	400	378	357	339	323	308
991	882	788	714	653	600	567	536	509	484	462
1329	1181	1053	953	871	800	755	714	677	644	615
1670	1482	1320	1193	1090	1000	943	892	845	804	767
2014	1785	1589	1434	1309	1200	1132	1070	1014	964	919
2362	2091	1859	1676	1528	1400	1320	1248	1182	1123	1071
2715	2400	2130	1919	1748	1600	1508	1425	1349	1282	1223
3073	2711	2403	2163	1968	1800	1696	1602	1517	1441	1373
3434	3026	2678	2407	2189	2000	1884	1779	1684	1599	1524
3799	3343	2954	2652	2410	2200	2072	1955	1850	1756	1674
4169	3662	3232	2898	2631	2400	2259	2132	2016	1914	1824
4542	3984	3511	3145	2853	2600	2447	2308	2183	2071	1974
4921	4309	3792	3393	3075	2800	2635	2485	2349	2229	2123
5303	4637	4074	3641	3297	3000	2822	2661	2515	2386	2272
5689	4968	4358	3890	3519	3200	3010	2837	2681	2542	2421
6081	5301	4643	4140	3742	3400	3197	3012	2846	2698	2569
6477	5638	4930	4391	3966	3600	3384	3188	3011	2854	2717
6877	5977	5220	4643	4190	3800	3571	3363	3176	3010	2865
7283	6320	5510	4896	4414	4000	3758	3538	3340	3165	3012

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	6.7	0:49	6.1	0:47	5.3	0:44	4.8	0:42	4.4	0:40
400	13.9	1:37	12.9	1:31	11.5	1:24	10.7	1:20	10.1	1:16
600	21.0	2:25	19.5	2:17	17.5	2:06	16.4	1:59	15.6	1:53
800	27.9	3:15	26.0	3:04	23.4	2:48	22.0	2:39	20.9	2:30
1000	34.7	4:04	32.4	3:51	29.3	3:30	27.5	3:19	26.2	3:07
1200	41.3	4:55	38.6	4:40	35.0	4:14	32.9	3:59	31.3	3:45
1400	47.8	5:46	44.7	5:28	40.6	4:58	38.2	4:40	36.3	4:23
1600	54.2	6:38	50.8	6:17	46.2	5:42	43.4	5:22	41.3	5:02
1800	60.5	7:31	56.7	7:07	51.7	6:27	48.5	6:03	46.1	5:41
2000	66.7	8:24	62.6	7:57	57.2	7:12	53.6	6:45	51.0	6:20
2200	72.9	9:19	68.3	8:48	62.4	7:58	58.5	7:28	55.6	7:00
2400	79.0	10:14	74.0	9:39	67.7	8:44	63.4	8:11	60.2	7:39
2600	85.1	11:10	79.5	10:31	72.8	9:31	68.2	8:54	64.8	8:20
2800	91.0	12:07	85.0	11:24	77.8	10:18	73.0	9:38	69.2	9:01
3000	96.9	13:04	90.4	12:17	82.8	11:06	77.7	10:22	73.6	9:41
3200	102.5	14:03	95.7	13:12	87.6	11:54	82.3	11:07	77.9	10:23
3400	108.1	15:02	101.0	14:06	92.4	12:43	86.8	11:53	82.2	11:05
3600	113.6	16:02	106.2	15:02	97.1	13:33	91.3	12:38	86.4	11:47
3800	119.0	17:04	111.3	15:58	101.7	14:23	95.6	13:24	90.5	12:30
4000	124.4	18:05	116.4	16:54	106.3	15:13	100.0	14:11	94.7	13:13

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.4	-0.7	0.0	0.8	2.0	3.5	5.4	7.6
20	-2.1	-1.1	0.0	1.6	3.7	6.3	9.4	13.1
30	-2.9	-1.5	0.0	2.3	5.3	8.9	13.2	18.1
40	-3.7	-1.9	0.0	3.0	6.8	11.4	16.6	22.7
50	-4.6	-2.4	0.0	3.7	8.2	13.6	19.8	26.8
60	-5.4	-2.8	0.0	4.3	9.5	15.6	22.6	30.5
70	-6.3	-3.3	0.0	4.9	10.7	17.5	25.1	33.7
80	-7.2	-3.7	0.0	5.5	11.8	19.1	27.4	36.5
90	-8.1	-4.2	0.0	6.0	12.8	20.6	29.3	38.8
100	-9.1	-4.7	0.0	6.4	13.7	21.9	30.9	40.7
110	-10.1	-5.1	0.0	6.9	14.5	22.9	32.1	42.1
120	-11.1	-5.6	0.0	7.3	15.2	23.8	33.1	43.1
130	-12.1	-6.1	0.0	7.6	15.8	24.5	33.8	43.6

Descent at VREF30+80

PRESSURE ALT (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	41	45	49	53	57	61	65	69	73	78
TIME (MINUTES)	12	12	13	14	15	16	16	17	18	18

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000	25000	30000	35000
300	EPR	1.137	1.167	1.227	1.312				
	KIAS	248	248	248	248				
	FF/ENG	7150	7150	7170	7260				
280	EPR	1.123	1.15	1.202	1.278				
	KIAS	242	242	242	242				
	FF/ENG	6660	6660	6660	6710				
260	EPR	1.11	1.134	1.179	1.247	1.345			
	KIAS	236	236	236	236	236			
	FF/ENG	6190	6180	6170	6200	6330			
240	EPR	1.097	1.119	1.159	1.218	1.302			
	KIAS	229	229	229	229	229			
	FF/ENG	5750	5730	5720	5720	5780			
220	EPR	1.087	1.105	1.14	1.191	1.264	1.377		
	KIAS	223	223	223	223	223	223		
	FF/ENG	5330	5290	5280	5260	5280	5420		
200	EPR	1.077	1.092	1.123	1.167	1.231	1.324		
	KIAS	216	216	216	216	216	216		
	FF/ENG	5040	4880	4850	4830	4830	4900		
180	EPR	1.067	1.081	1.107	1.145	1.2	1.279	1.406	
	KIAS	209	209	209	209	209	209	209	
	FF/ENG	4640	4480	4430	4420	4400	4430	4560	
160	EPR	1.058	1.07	1.092	1.125	1.171	1.24	1.342	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	4240	4190	4030	4010	3990	3990	4060	
140	EPR	1.049	1.06	1.079	1.106	1.145	1.205	1.286	1.427
	KIAS	194	194	194	194	194	194	194	194
	FF/ENG	3840	3800	3640	3670	3660	3580	3600	3720

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.140	1.169	1.226		
	KIAS	228	228	228		
	FF/ENG	6830	6830	6830		
280	EPR	1.126	1.153	1.203	1.277	
	KIAS	222	222	222	222	
	FF/ENG	6370	6360	6350	6380	
260	EPR	1.113	1.137	1.181	1.247	
	KIAS	216	216	216	216	
	FF/ENG	5920	5900	5890	5900	
240	EPR	1.101	1.122	1.162	1.219	1.302
	KIAS	209	209	209	209	209
	FF/ENG	5490	5460	5450	5440	5480
220	EPR	1.090	1.108	1.143	1.192	1.265
	KIAS	203	203	203	203	203
	FF/ENG	5060	5020	5000	4990	5010
200	EPR	1.080	1.095	1.125	1.167	1.230
	KIAS	196	196	196	196	196
	FF/ENG	4760	4600	4570	4560	4560
180	EPR	1.069	1.083	1.108	1.145	1.198
	KIAS	189	189	189	189	189
	FF/ENG	4340	4300	4140	4130	4120
160	EPR	1.059	1.072	1.092	1.124	1.167
	KIAS	182	182	182	182	182
	FF/ENG	3930	3890	3740	3770	3760
140	EPR	1.049	1.060	1.079	1.103	1.140
	KIAS	174	174	174	174	174
	FF/ENG	3590	3550	3500	3360	3350

This table includes 5% additional fuel for holding in a racetrack pattern.

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GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
240	226	227	1800		
220	209	221	5800	3800	500
200	190	214	9000	7300	5500
180	171	207	12200	10500	8800
160	153	200	15500	13700	11900
140	134	192	18300	16800	15200

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
220	3700		
200	7400	5700	5600
180	10800	9100	7200
160	14300	12500	10700
140	17400	15900	14100

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)						
		5	7	9	11	13	15	17
220	EPR	1.350						
	MACH	.369						
	KIAS	223						
	FF/ENG	9949						
200	EPR	1.310	1.348	1.393				
	MACH	.358	.371	.385				
	KIAS	216	216	216				
	FF/ENG	9096	9139	9222				
180	EPR	1.273	1.305	1.343	1.388			
	MACH	.346	.359	.373	.387			
	KIAS	209	209	209	209			
	FF/ENG	8291	8303	8340	8414			
160	EPR	1.238	1.266	1.298	1.335	1.379	1.432	
	MACH	.334	.346	.359	.373	.388	.403	
	KIAS	202	202	202	202	202	202	
	FF/ENG	7496	7504	7513	7541	7605	7701	
140	EPR	1.205	1.228	1.256	1.287	1.323	1.365	1.416
	MACH	.321	.333	.345	.359	.373	.387	.403
	KIAS	194	194	194	194	194	194	194
	FF/ENG	6729	6721	6725	6732	6750	6799	6877

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
170	150	132	119	109	100	93	88	83	78	75
349	305	269	241	219	200	187	175	164	154	146
529	462	406	363	329	300	279	260	244	230	218
710	620	544	486	440	400	372	347	325	306	290
892	778	681	608	550	500	465	433	406	381	361
1075	936	819	730	660	600	558	520	487	458	433
1259	1096	958	853	771	700	651	606	567	533	504
1444	1256	1097	976	882	800	743	692	647	608	575
1630	1416	1236	1100	992	900	836	778	727	683	646
1817	1577	1375	1223	1103	1000	928	864	808	759	717

Reference Fuel and Time Required at Check Point

AIR DIST(NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	3.3	0:28	3.1	0:27	2.9	0:27	2.7	0:26	2.6	0:26
200	6.9	0:54	6.6	0:53	6.4	0:52	6.1	0:50	5.9	0:49
300	10.5	1:21	10.1	1:19	9.8	1:17	9.5	1:15	9.2	1:13
400	14.1	1:48	13.6	1:45	13.2	1:42	12.8	1:39	12.5	1:36
500	17.6	2:15	17.0	2:11	16.5	2:07	16.1	2:04	15.7	2:00
600	21.1	2:42	20.4	2:37	19.8	2:33	19.3	2:29	18.9	2:24
700	24.6	3:09	23.8	3:04	23.1	2:59	22.5	2:54	22.0	2:49
800	28.0	3:37	27.1	3:31	26.3	3:25	25.6	3:19	25.1	3:13
900	31.3	4:05	30.4	3:58	29.5	3:51	28.8	3:44	28.1	3:37
1000	34.7	4:33	33.6	4:25	32.7	4:17	31.8	4:09	31.2	4:02

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
4	-0.4	-0.2	0.0	0.3	0.8	1.3
6	-0.7	-0.3	0.0	0.5	1.2	2.0
8	-0.9	-0.5	0.0	0.7	1.6	2.7
10	-1.2	-0.6	0.0	0.9	2.0	3.3
12	-1.4	-0.7	0.0	1.0	2.4	4.0
14	-1.7	-0.8	0.0	1.2	2.7	4.6
16	-1.9	-1.0	0.0	1.4	3.1	5.2
18	-2.1	-1.1	0.0	1.5	3.5	5.8
20	-2.4	-1.2	0.0	1.7	3.8	6.4
22	-2.6	-1.3	0.0	1.8	4.1	7.0
24	-2.9	-1.4	0.0	2.0	4.5	7.5
26	-3.1	-1.6	0.0	2.1	4.8	8.0
28	-3.3	-1.7	0.0	2.3	5.1	8.5
30	-3.6	-1.8	0.0	2.4	5.4	9.0
32	-3.8	-1.9	0.0	2.6	5.7	9.5
34	-4.1	-2.0	0.0	2.7	6.0	10.0
36	-4.3	-2.2	0.0	2.8	6.2	10.4

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
240	EPR	1.322	1.394		
	KIAS	229	229		
	FF/ENG	11260	11400		
220	EPR	1.288	1.350		
	KIAS	223	223		
	FF/ENG	10380	10450		
200	EPR	1.256	1.310	1.419	
	KIAS	216	216	216	
	FF/ENG	9530	9550	9740	
180	EPR	1.226	1.273	1.365	
	KIAS	209	209	209	
	FF/ENG	8700	8710	8790	
160	EPR	1.197	1.238	1.316	1.432
	KIAS	202	202	202	202
	FF/ENG	7880	7870	7900	8090
140	EPR	1.171	1.205	1.271	1.365
	KIAS	194	194	194	194
	FF/ENG	7090	7070	7060	7140

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Text — Section 18

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

FMC Takeoff Speeds

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

Dry Snow

Enter the table with the dry snow depth and read the Equivalent Slush/Standing Water Depth used to enter the Slush/Standing Water table.

Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

(1) Determine the dry field/obstacle limit weight for the takeoff flap setting.

(2) Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.

(3) Adjust field length available for temperature by amount shown on chart.

(4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

(1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.

(2) If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

Slippery Runway

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will

appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

If takeoffs are scheduled using these simplified speeds in conjunction with airport analyses that include clearway and/or stopway credits, adjustments to V1 speed are required.

Adjust V1 by the amount shown in the Clearway/Stopway table. The adjusted V1 must not exceed VR.

The maximum allowable clearway limits shown on the takeoff speeds page are provided for guidance when more precise data is unavailable.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around EPR

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

Max Climb EPR

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average EPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target EPR, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target EPR, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 is based on

VREF30+60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC/320 KIAS speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target EPR, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative for Long Range Cruise and 320 KIAS. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit and the more limiting of the two must be used as the landing limit weight. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

Max Cruise %N1

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Alternate Mode EEC, Engine Inoperative

Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

Driftdown/LRC Cruise Range Capability

Engine inoperative range capability is provided to determine the fuel and time required for a specified distance when the recommended driftdown procedure is followed.

Long Range Cruise Altitude Capability

Altitude capability is provided in the same format as the gear up data shown in Chapter 3 for Max Climb Thrust and Long Range Cruise speed with 100 ft/min residual rate of climb.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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777-200ER TRENT892 KG FAA

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Performance Inflight — Chapter PI
General — Section 20

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	250
3000	300
3500	340
4000	380
4500	430

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)			
	100	120	140	160
300	-3	-3	-3	-4
200	-3	-3	-3	-3
100	-2	-1	-1	-1
0	0	0	0	0
-100	3	2	2	1
-200	5	4	3	3
-300	6	4	4	4

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
300	166	174	180
290	164	171	177
280	161	168	174
270	157	165	171
260	154	162	168
250	151	159	164
240	148	156	161
230	145	152	158
220	142	149	154
210	139	145	150
200	135	142	147
190	132	138	143
180	128	134	139
170	124	131	135
160	121	127	131
150	117	123	127
140	113	118	123

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

Dry Snow Conversion Table

Dry Snow Depth (mm)	Equivalent Slush/Standing Water Depth (mm)
20	2.50
40	5.00
60	7.50
80	10.00
100	12.50

For dry snow, enter the Slush/Standing Water table with the equivalent depth shown in the table above.

ADVISORY INFORMATION

Slush/Standing Water Takeoff
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.08 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-32.9	-38.0	-43.0	-38.5	-43.6	-48.7	-50.7	-55.8	-60.9
300	-30.9	-36.0	-41.0	-35.8	-40.8	-45.9	-46.2	-51.3	-56.4
280	-28.6	-33.7	-38.8	-32.8	-37.9	-43.0	-41.7	-46.8	-51.8
260	-26.1	-31.2	-36.3	-29.6	-34.7	-39.8	-37.0	-42.0	-47.1
240	-23.4	-28.5	-33.5	-26.2	-31.3	-36.4	-32.1	-37.2	-42.3
220	-20.4	-25.4	-30.5	-22.6	-27.6	-32.7	-27.2	-32.3	-37.4
200	-17.1	-22.2	-27.3	-18.7	-23.8	-28.9	-22.1	-27.2	-32.3
180	-13.6	-18.6	-23.7	-14.6	-19.7	-24.8	-16.9	-22.0	-27.1
160	-9.8	-14.9	-19.9	-10.3	-15.4	-20.5	-11.6	-16.7	-21.8
140	-5.9	-11.0	-16.1	-5.9	-11.0	-16.1	-6.2	-11.3	-16.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800							109.3		
2000	109.8			123.7			147.5	103.3	
2200	148.5	103.7		162.3	117.5		185.9	141.5	
2400	187.4	142.4		201.6	156.2	111.4	225.4	179.8	135.4
2600	227.7	181.2	136.3	242.3	195.3	150.1	266.0	219.1	173.7
2800	269.7	221.2	175.0	284.4	235.7	189.0	307.9	259.5	212.8
3000	313.5	262.9	214.8	328.3	277.7	229.2	350.8	301.2	253.0
3200	358.6	306.5	256.2	372.5	321.3	270.9		344.0	294.5
3400		351.4	299.4			314.3			337.2
3600			344.3			358.6			

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.**
2. **Adjust field length available by -55 m/+55 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-18	-14	-10	-13	-9	-5	-5	-1	3
300	-19	-15	-11	-14	-10	-6	-4	0	4
280	-20	-16	-12	-16	-12	-8	-5	-1	3
260	-22	-18	-14	-18	-14	-10	-8	-4	0
240	-24	-20	-16	-20	-16	-12	-11	-7	-3
220	-25	-21	-17	-22	-18	-14	-15	-11	-7
200	-26	-22	-18	-23	-19	-15	-18	-14	-10
180	-26	-22	-18	-24	-20	-16	-20	-16	-12
160	-26	-22	-18	-24	-20	-16	-20	-16	-12
140	-26	-22	-18	-24	-20	-16	-20	-16	-12

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Slippery Runway Takeoff

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.5	-2.9	-14.9	-16.3	-17.8	-31.3	-32.8	-34.2
300	0.0	-1.5	-2.9	-16.3	-17.7	-19.2	-31.2	-32.7	-34.1
280	-0.4	-1.9	-3.3	-17.1	-18.5	-20.0	-30.6	-32.0	-33.5
260	-1.9	-3.4	-4.8	-17.3	-18.7	-20.2	-29.3	-30.7	-32.2
240	-2.9	-4.4	-5.8	-16.8	-18.3	-19.7	-27.4	-28.8	-30.3
220	-3.4	-4.9	-6.3	-15.7	-17.2	-18.6	-24.9	-26.3	-27.8
200	-3.4	-4.9	-6.3	-14.0	-15.4	-16.9	-21.8	-23.2	-24.7
180	-2.9	-4.4	-5.8	-11.6	-13.1	-14.5	-18.1	-19.5	-21.0
160	-1.9	-3.3	-4.8	-8.6	-10.1	-11.5	-13.8	-15.2	-16.7
140	-0.6	-2.0	-3.5	-5.3	-6.8	-8.2	-9.2	-10.6	-12.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	104.2								
1600	182.9	135.0							
1800	258.6	212.9	165.8						
2000	330.7	287.1	242.3	146.3	100.0				
2200		358.5	315.2	201.1	154.3	108.0			
2400				257.7	209.3	162.3	114.1		
2600				316.4	266.2	217.5	148.1	104.6	
2800				376.2	325.2	274.7	182.5	138.6	
3000						333.9	218.3	172.7	129.1
3200							256.0	208.1	163.1
3400							295.9	245.2	198.0
3600							338.1	284.5	234.6
3800								326.2	273.3
4000								368.6	314.3

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+30 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+40 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+60 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limited weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-3	-1	1	-12	-10	-8	-24	-22	-20
300	-4	-2	0	-14	-12	-10	-27	-25	-23
280	-6	-4	-2	-16	-14	-12	-30	-28	-26
260	-7	-5	-3	-19	-17	-15	-33	-31	-29
240	-9	-7	-5	-21	-19	-17	-36	-34	-32
220	-10	-8	-6	-23	-21	-19	-39	-37	-35
200	-11	-9	-7	-25	-23	-21	-41	-39	-37
180	-12	-10	-8	-26	-24	-22	-43	-41	-39
160	-13	-11	-9	-27	-25	-23	-44	-42	-40
140	-14	-12	-10	-28	-26	-24	-45	-43	-41

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

Takeoff Speeds

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
300	164	170	175	157	162	168	152	157	163
290	160	167	173	153	159	165	149	154	161
280	157	163	170	150	156	163	146	151	158
270	154	160	167	147	153	160	143	148	155
260	150	157	164	144	150	157	139	145	153
250	147	153	161	140	146	154	136	142	150
240	143	150	158	137	143	152	133	138	147
230	139	146	155	133	139	149	129	135	144
220	136	142	152	129	136	146	126	131	142
210	132	139	149	126	132	143	122	128	139
200	127	135	146	121	129	140	117	124	136
190	123	131	142	117	125	136	113	120	133
180	117	126	139	112	121	133	109	117	129
170	112	122	135	107	117	130	104	113	126
160	107	118	131	103	113	126	99	109	123
150	102	113	128	98	108	123	94	104	119
140	97	109	124	93	104	119	90	100	116

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	8	10	12			3	4	5	6			-2	-2	-3	-3		
50	122	4	5	7	9	11	13	2	2	3	4	5	6	-1	-1	-2	-2	-3	-3
40	104	1	2	4	7	8	10	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	2	5	7	9	0	0	1	2	4	5	0	0	-1	-1	-2	-2
20	68	0	0	1	3	6	7	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	-1	2	-15	-10	-5	0	10	20	30	40
300	-5	-2	0	2	4	-2	-1	-1	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
180	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
140	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2

Clearway and Stopway V1 Adjustments*

NORMAL V1 (KIAS)	CLEARWAY MINUS STOPWAY (M)						
	300	200	100	0	-100	-200	-300
100	-3	-3	-2	0	3	5	6
120	-3	-3	-1	0	2	4	4
140	-3	-3	-1	0	2	3	4
160	-4	-3	-1	0	1	3	4

***V1 not to exceed VR**

Takeoff Speeds

Max Allowable Clearway for V1 Adjustment

FIELD LENGTH (M)	1500	2000	2500	3000	3500	4000	4500
MAX ALLOWABLE CLEARWAY (M)	80	110	130	150	170	200	220

ADVISORY INFORMATION

TO1 - Slush/Standing Water Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-31.4	-36.2	-41.0	-37.7	-42.4	-47.2	-50.4	-55.2	-60.0
300	-29.9	-34.7	-39.4	-35.1	-39.8	-44.6	-46.2	-51.0	-55.7
280	-28.1	-32.8	-37.6	-32.5	-37.2	-42.0	-41.9	-46.7	-51.5
260	-25.9	-30.6	-35.4	-29.6	-34.4	-39.1	-37.5	-42.3	-47.1
240	-23.4	-28.2	-33.0	-26.5	-31.3	-36.0	-32.9	-37.7	-42.5
220	-20.7	-25.5	-30.3	-23.1	-27.9	-32.7	-28.1	-33.0	-37.8
200	-17.6	-22.4	-27.3	-19.4	-24.3	-29.1	-23.2	-28.1	-32.9
180	-14.3	-19.1	-24.0	-15.5	-20.4	-25.2	-18.2	-23.0	-27.9
160	-10.7	-15.5	-20.4	-11.4	-16.2	-21.1	-13.0	-17.8	-22.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800							129.8		
2000	133.4			147.2			170.8	123.4	
2200	175.0	126.9		189.0	140.6		212.8	164.3	
2400	218.1	168.4	120.3	232.5	182.4	134.1	256.3	206.1	157.9
2600	263.2	211.2	161.8	278.0	225.6	175.7	301.5	249.4	199.4
2800	310.8	256.0	204.3	325.5	270.7	218.7		294.3	242.4
3000		303.1	248.8		318.0	263.5			287.1
3200			295.5			310.4			333.4

1. **Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -55 m/+55 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-16	-12	-7	-11	-6	-2	-1	4	8
280	-17	-13	-9	-12	-8	-4	-2	2	7
260	-19	-15	-11	-15	-10	-6	-4	0	4
240	-21	-17	-12	-17	-13	-8	-8	-4	1
220	-22	-18	-14	-19	-15	-11	-11	-7	-3
200	-23	-19	-15	-21	-17	-12	-15	-10	-6
180	-24	-20	-15	-22	-18	-13	-17	-13	-8
160	-24	-19	-15	-22	-18	-13	-18	-13	-9

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 - Slippery Runway Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.2	-2.5	-12.9	-14.3	-15.7	-28.7	-30.1	-31.5
300	0.0	-1.2	-2.5	-14.2	-15.6	-17.0	-29.4	-30.8	-32.2
280	0.0	-1.2	-2.6	-15.5	-16.9	-18.3	-29.3	-30.7	-32.0
260	-0.8	-2.2	-3.5	-16.2	-17.6	-18.9	-28.5	-29.9	-31.2
240	-2.1	-3.5	-4.9	-16.2	-17.5	-18.9	-27.0	-28.4	-29.8
220	-3.0	-4.3	-5.7	-15.5	-16.8	-18.2	-24.9	-26.3	-27.7
200	-3.2	-4.6	-6.0	-14.1	-15.5	-16.9	-22.2	-23.6	-25.0
180	-3.0	-4.3	-5.7	-12.1	-13.4	-14.8	-18.8	-20.2	-21.6
160	-2.1	-3.5	-4.9	-9.4	-10.8	-12.1	-14.8	-16.2	-17.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	131.2								
1600	212.7	163.4							
1800	290.2	243.5	195.2						
2000		319.5	273.6	172.4	123.9				
2200				230.7	180.9	132.3			
2400				291.3	239.5	189.4	133.7		
2600					300.4	248.3	169.5	123.8	
2800						309.6	206.5	159.5	
3000							245.6	196.0	149.5
3200							286.9	234.4	185.6
3400							331.0	275.1	223.5
3600								318.5	263.5
3800									306.1

1. **Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+30 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+40 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+60 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO1 - Slippery Runway Takeoff
8% Thrust Reduction
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-4	-2	-1	-13	-11	-9	-24	-22	-20
280	-5	-4	-2	-15	-13	-11	-27	-25	-23
260	-7	-5	-3	-17	-15	-13	-30	-28	-26
240	-8	-6	-4	-19	-17	-15	-33	-31	-29
220	-9	-7	-6	-20	-19	-17	-35	-33	-31
200	-10	-8	-7	-22	-20	-18	-38	-36	-34
180	-11	-9	-8	-23	-22	-20	-39	-38	-36
160	-12	-10	-8	-24	-22	-21	-41	-39	-37

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

TO1 Takeoff Speeds
8% Thrust Reduction
V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
300	167	171	175						
290	164	168	172	157	160	165			
280	160	165	169	153	157	162	149	152	157
270	157	161	166	150	154	159	146	149	155
260	153	158	163	147	151	157	142	146	152
250	150	154	160	143	147	154	139	143	149
240	146	151	157	140	144	151	135	139	147
230	142	147	154	136	140	148	132	136	144
220	138	143	151	132	137	145	128	133	141
210	135	140	148	129	133	142	124	129	138
200	130	136	145	124	130	139	120	125	135
190	125	132	141	120	126	136	116	122	132
180	121	128	138	115	122	132	111	118	129
170	116	124	134	110	118	129	106	114	125
160	110	119	131	105	114	125	102	110	122

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESSURE ALT (1000 FT)							PRESSURE ALT (1000 FT)							PRESSURE ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
60	140	7	8	10	12				3	4	5	5				-2	-2	-2	-3			
50	122	4	5	7	9	11	13	15	2	2	3	4	5	6	7	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	4	7	9	11	13	1	1	2	3	4	5	6	0	-1	-1	-2	-2	-2	-3
30	86	0	0	2	5	7	9	11	0	0	1	2	3	4	5	0	0	-1	-1	-1	-2	-2
20	68	0	0	2	4	6	8	10	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2
-60	-76	0	0	2	4	6	7	9	0	0	1	2	3	4	5	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
300	-5	-2	0	2	4	-2	-1	0	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-1	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-1	-1	0	0	0	1	1	2
180	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2

ADVISORY INFORMATION

TO2 - Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLES LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-31.1	-35.3	-39.5	-37.4	-41.6	-45.8	-51.0	-55.3	-59.6
300	-29.4	-33.6	-37.8	-34.9	-39.1	-43.4	-47.0	-51.3	-55.6
280	-27.5	-31.8	-36.1	-32.3	-36.6	-40.9	-42.8	-47.1	-51.4
260	-25.8	-30.1	-34.4	-29.8	-34.1	-38.4	-38.6	-43.0	-47.3
240	-23.7	-28.0	-32.4	-27.1	-31.4	-35.8	-34.3	-38.7	-43.1
220	-21.3	-25.7	-30.1	-24.1	-28.4	-32.8	-29.9	-34.2	-38.6
200	-18.6	-23.0	-27.4	-20.7	-25.1	-29.6	-25.2	-29.6	-34.0
180	-15.6	-20.0	-24.5	-17.1	-21.5	-26.0	-20.3	-24.8	-29.2
160	-12.2	-16.7	-21.1	-13.2	-17.6	-22.1	-15.3	-19.7	-24.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800	128.8			142.6			166.3		
2000	177.3	121.2		191.3	134.9		215.1	158.7	
2200	227.0	169.6		241.5	183.6	127.3	265.2	207.3	151.1
2400	278.6	219.0	162.0	293.4	233.5	175.9	316.8	257.2	199.6
2600	332.4	270.3	211.1		285.1	225.5		308.5	249.3
2800		323.9	262.1		338.5	276.9			300.4
3000			315.3			330.1			

1. **Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -55 m/+55 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT(FT)			PRESS ALT(FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
260	-15	-10	-5	-10	-5	0	2	7	12
240	-17	-12	-7	-12	-8	-3	-2	3	8
220	-19	-14	-9	-15	-10	-5	-6	-1	4
200	-20	-15	-11	-17	-12	-8	-10	-5	0
180	-21	-16	-11	-19	-14	-9	-13	-8	-3
160	-21	-16	-11	-19	-14	-9	-14	-9	-4

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 - Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.3	-2.5	-9.8	-11.0	-12.2	-26.4	-27.6	-29.8
300	0.0	-1.3	-2.5	-11.4	-12.6	-13.9	-27.0	-28.3	-29.6
280	0.0	-1.3	-2.5	-13.0	-14.2	-15.5	-27.2	-28.4	-29.7
260	0.0	-1.3	-2.5	-14.4	-15.6	-16.9	-27.1	-28.4	-29.6
240	-0.9	-2.2	-3.4	-15.0	-16.3	-17.6	-26.3	-27.6	-28.9
220	-2.2	-3.5	-4.7	-15.0	-16.2	-17.5	-24.8	-26.1	-27.4
200	-2.9	-4.2	-5.5	-14.2	-15.4	-16.7	-22.7	-23.9	-25.2
180	-3.1	-4.3	-5.6	-12.7	-13.9	-15.2	-19.8	-21.1	-22.3
160	-2.6	-3.9	-5.2	-10.4	-11.7	-13.0	-16.2	-17.5	-18.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	175.8	121.8							
1600	261.2	209.7	156.5						
1800		293.3	242.9	155.3					
2000			324.9	217.7	164.3				
2200				282.7	227.1	173.4	128.8		
2400					292.6	236.5	167.5		
2600						302.5	207.7	156.7	
2800							250.4	196.3	145.9
3000							296.0	238.2	185.0
3200								282.9	226.2
3400								330.8	270.1
3600									317.2

1. **Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+30 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+40 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+60 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO2 - Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
260	-6	-5	-3	-14	-12	-11	-25	-23	-22
240	-7	-6	-4	-16	-14	-13	-28	-26	-24
220	-8	-7	-6	-18	-16	-15	-30	-29	-27
200	-9	-8	-7	-19	-18	-16	-33	-31	-29
180	-10	-9	-8	-20	-19	-17	-35	-33	-31
160	-11	-10	-8	-21	-20	-18	-36	-34	-32

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

TO2 Takeoff Speeds
20% Thrust Reduction
V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
260	158	160	162						
250	155	156	159	148	149	153			
240	151	153	156	145	146	150	140	141	146
230	147	149	153	141	142	147	137	138	143
220	143	146	150	137	139	144	133	135	140
210	140	142	147	134	135	141	130	131	137
200	135	138	144	129	132	138	125	127	134
190	131	134	140	125	128	135	121	124	131
180	126	130	137	120	124	131	116	120	128
170	121	126	133	116	120	128	112	116	124
160	116	121	130	110	116	124	107	112	121

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESSURE ALT (1000 FT)							PRESSURE ALT (1000 FT)							PRESSURE ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
60	140	6	7	9	11				3	3	4	5				-1	-2	-2	-2			
50	122	3	4	6	8	10	12	14	2	2	3	4	5	6	7	-1	-1	-1	-2	-2	-2	-3
40	104	1	2	4	6	7	9	11	1	1	2	3	4	5	5	0	-1	-1	-1	-2	-2	-2
30	86	0	0	2	4	6	7	10	0	0	1	2	3	4	5	0	0	-1	-1	-1	-2	-2
20	68	0	0	1	3	5	6	8	0	0	1	2	3	3	4	0	0	0	-1	-1	-1	-2
-60	-76	0	0	1	3	5	6	8	0	0	1	2	2	3	4	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
260	-3	-1	0	2	1	-1	-1	0	0	1	1	1	2
240	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
220	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
200	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
180	-3	-1	0	1	2	-2	-1	-1	0	0	1	1	1
160	-3	-1	0	1	2	-2	-1	-1	0	0	1	1	1

Minimum Control Speeds

V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	109	111	106	108		
50	122	112	114	106	108	101	104
40	104	118	119	109	110	101	104
30	86	122	123	113	114	104	106
20	68	123	123	115	117	107	109
-60	-76	124	124	116	117	109	110

TO1 V1(MCG), Minimum VR
8% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)							
		0		4000		8000		10000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	105	106	102	103				
50	122	107	109	102	103	97	99	95	97
40	104	113	115	104	106	97	99	94	96
30	86	117	118	108	110	100	102	96	99
20	68	118	119	110	112	103	105	99	101
-60	-76	119	119	111	112	104	106	101	103

TO2 V1(MCG), Minimum VR
20% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)							
		0		4000		8000		10000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	97	99	94	96				
50	122	100	102	94	96	91	93	89	91
40	104	105	107	97	99	91	93	88	90
30	86	109	110	101	103	93	96	90	92
20	68	109	111	103	104	96	98	92	94
-60	-76	110	111	104	105	97	99	94	96

Go-around EPR

Based on engine bleed for packs on and anti-ice off

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
66	150	70	1.269	1.282	1.284	1.287	1.289	1.290	1.290	1.289	1.287	1.284	1.281	1.278
56	133	60	1.316	1.324	1.328	1.332	1.335	1.337	1.339	1.339	1.338	1.336	1.334	1.332
51	124	55	1.347	1.356	1.356	1.355	1.359	1.361	1.363	1.365	1.364	1.362	1.361	1.359
46	115	50	1.380	1.390	1.392	1.392	1.388	1.387	1.388	1.390	1.389	1.388	1.388	1.387
41	106	45	1.406	1.429	1.428	1.428	1.421	1.416	1.416	1.416	1.415	1.414	1.414	1.414
36	97	40	1.431	1.461	1.461	1.460	1.453	1.446	1.445	1.445	1.444	1.443	1.442	1.441
31	88	35	1.443	1.492	1.491	1.491	1.483	1.477	1.475	1.474	1.473	1.473	1.472	1.471
26	79	30	1.443	1.498	1.511	1.518	1.512	1.505	1.506	1.505	1.504	1.504	1.502	1.502
21	70	25	1.443	1.498	1.511	1.521	1.526	1.531	1.527	1.529	1.528	1.527	1.525	1.525
17	62	20	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.545	1.546	1.541	1.539
12	53	15	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.561
8 & BELOW	46 & BELOW	12 & BELOW	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.571

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.003	0.003	0.003	0.003	0.004	0.004	0.005
1 PACK ON - 2 BLEED SOURCES	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
1 PACK ON - 1 BLEED SOURCE	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
WING ANTI-ICE ON	-0.002	-0.004	-0.004	-0.005	-0.005	-0.006	-0.006

Max Climb EPR

Based on engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	1.132	1.122	1.127	1.146	1.166	1.159	1.152	1.174	1.178	1.170
50	1.168	1.161	1.147	1.146	1.166	1.159	1.152	1.174	1.178	1.170
40	1.209	1.205	1.191	1.184	1.173	1.159	1.152	1.174	1.178	1.170
30	1.217	1.253	1.243	1.237	1.228	1.196	1.157	1.174	1.178	1.170
20	1.217	1.253	1.284	1.298	1.292	1.259	1.228	1.191	1.178	1.170
10	1.217	1.253	1.284	1.329	1.364	1.337	1.307	1.273	1.260	1.257
0	1.217	1.253	1.284	1.329	1.374	1.399	1.402	1.367	1.351	1.348
-10	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.482	1.468	1.465
-15 & BELOW	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.506	1.521	1.518

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003	-0.004	-0.005
ENGINE & WING*	-0.010	-0.012	-0.018	-0.020	-0.012	-0.012	-0.011	-0.014	-0.017	-0.019
ENGINE & WING**	-0.012	-0.014	-0.021	-0.025	-0.018	-0.019	-0.020	-0.024	-0.029	-0.033

***Wing anti-ice on, packs on.**
****Wing anti-ice on, single bleed source and both packs off.**

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	**PITCH ATT**	**4.0**	**3.5**		
	V/S (FT/MIN)	1600	800		
30000 (280 KIAS)	**PITCH ATT**	**4.5**	**4.5**	**4.0**	**4.5**
	V/S (FT/MIN)	2300	1600	1100	700
20000 (270 KIAS)	**PITCH ATT**	**7.5**	**7.0**	**6.5**	**6.5**
	V/S (FT/MIN)	3700	2700	2100	1600
10000 (270 KIAS)	**PITCH ATT**	**10.0**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	4500	3400	2700	2100
SEA LEVEL (270 KIAS)	**PITCH ATT**	**12.0**	**10.5**	**9.5**	**9.0**
	V/S (FT/MIN)	5100	3900	3100	2500

Cruise

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82 M)	**PITCH ATT**	**2.0**	**2.5**		
	EPR	1.129	1.249		
	(Alt Mode %N1)	(79.0)	(83.4)		
35000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**
	EPR	1.065	1.118	1.203	1.356
	(Alt Mode %N1)	(76.7)	(78.9)	(82.3)	(87.2)
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**
	EPR	1.021	1.059	1.119	1.196
	(Alt Mode %N1)	(73.1)	(75.2)	(78.2)	(81.7)
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**
	EPR	0.997	1.024	1.067	1.124
	(Alt Mode %N1)	(69.7)	(71.7)	(74.4)	(77.5)
20000 (270 KIAS)	**PITCH ATT**	**2.0**	**2.5**	**3.0**	**4.0**
	EPR	0.986	1.008	1.039	1.081
	(Alt Mode %N1)	(65.2)	(67.7)	(70.5)	(73.6)
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**4.0**
	EPR	0.977	0.994	1.018	1.048
	(Alt Mode %N1)	(61.8)	(64.0)	(66.8)	(70.0)

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	**PITCH ATT**	**-1.0**	**-0.5**		
	V/S (FT/MIN)	-2500	-2400		
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**
	V/S (FT/MIN)	-2200	-1900	-1900	-1900
20000 (270 KIAS)	**PITCH ATT**	**-1.0**	**0.0**	**0.5**	**1.5**
	V/S (FT/MIN)	-1800	-1600	-1600	-1600
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**
	V/S (FT/MIN)	-1700	-1500	-1400	-1400
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**
	V/S (FT/MIN)	-1500	-1400	-1300	-1300

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		160	200	240	280
10000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	1.004	1.017	1.029	1.040
	(Alt Mode %N1)	(51.3)	(56.8)	(61.7)	(65.9)
	KIAS	202	216	234	253
5000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	0.999	1.009	1.019	1.027
	(Alt Mode %N1)	(47.4)	(52.6)	(57.4)	(61.8)
	KIAS	202	216	233	251

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 0 (GEAR UP) (VREF30 + 80)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**
	EPR	1.000	1.010	1.020	1.040
	(Alt Mode %N1)	(48.3)	(53.9)	(58.8)	(63.2)
	KIAS	201	216	229	241
FLAPS 1 (GEAR UP) (VREF30 + 60)	**PITCH ATT**	**6.0**	**6.5**	**7.0**	**7.0**
	EPR	1.020	1.030	1.050	1.060
	(Alt Mode %N1)	(49.5)	(55.4)	(60.9)	(65.4)
	KIAS	181	196	209	221
FLAPS 5 (GEAR UP) (VREF30 + 40)	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**
	EPR	1.030	1.050	1.070	1.090
	(Alt Mode %N1)	(50.1)	(57.2)	(62.4)	(66.7)
	KIAS	161	176	189	201
FLAPS 15 (GEAR UP) (VREF30 + 20)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**
	EPR	1.040	1.060	1.090	1.110
	(Alt Mode %N1)	(51.5)	(58.9)	(64.4)	(68.9)
	KIAS	141	156	169	181
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**
	EPR	1.070	1.100	1.130	1.170
	(Alt Mode %N1)	(58.6)	(65.7)	(70.6)	(74.9)
	KIAS	141	156	169	181

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 20 (VREF20 + 10)	**PITCH ATT**	**1.0**	**1.5**	**1.5**	**1.5**
	EPR	1.010	1.010	1.020	1.020
	(Alt Mode %N1)	(34.7)	(40.2)	(45.0)	(49.3)
	KIAS	142	157	172	185
FLAPS 25 (VREF25 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**
	EPR	1.030	1.040	1.050	1.070
	(Alt Mode %N1)	(44.1)	(50.7)	(56.2)	(60.6)
	KIAS	138	153	166	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**-0.5**	**0.0**	**0.0**	**0.0**
	EPR	1.050	1.070	1.090	1.110
	(Alt Mode %N1)	(50.5)	(56.9)	(62.4)	(66.8)
	KIAS	131	146	159	171

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 21

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	-1	33500*	33500*	33500*	33400	31900
290	31100	-3	34300*	34300*	34300*	34100	32700
280	31800	-5	35200*	35200*	35200*	34900	33400
270	32600	-7	36100*	36100*	36100*	35600	34200
260	33400	-8	36800*	36800*	36800*	36400	35000
250	34200	-10	37600*	37600*	37600*	37200	35800
240	35100	-12	38400*	38400*	38400*	38100	36600
230	36000	-14	39300*	39300*	39300*	39000	37500
220	36900	-14	40200*	40200*	40200*	39900	38500
210	37900	-14	41100*	41100*	41100*	40900	39400
200	38900	-14	42100*	42100*	42100*	41900	40400
190	40000	-14	43000	43000	43000	42900	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	4	32500*	32500*	32500*	32500*	31900
290	31100	3	33400*	33400*	33400*	33400*	32700
280	31800	1	34300*	34300*	34300*	34300*	33400
270	32600	-1	35200*	35200*	35200*	35200*	34200
260	33400	-3	36100*	36100*	36100*	36100*	35000
250	34200	-5	36900*	36900*	36900*	36900*	35800
240	35100	-7	37700*	37700*	37700*	37700*	36600
230	36000	-9	38600*	38600*	38600*	38600*	37500
220	36900	-9	39500*	39500*	39500*	39500*	38500
210	37900	-9	40400*	40400*	40400*	40400*	39400
200	38900	-9	41400*	41400*	41400*	41400*	40400
190	40000	-9	42400*	42400*	42400*	42400*	41500
180	41100	-9	43000	43000	43000	43000	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30300	10	31100*	31100*	31100*	31100*	31100*
290	31100	8	32100*	32100*	32100*	32100*	32100*
280	31800	7	33100*	33100*	33100*	33100*	33100*
270	32600	5	34100*	34100*	34100*	34100*	34100*
260	33400	3	35100*	35100*	35100*	35100*	35000
250	34200	1	36100*	36100*	36100*	36100*	35800
240	35100	-1	36800*	36800*	36800*	36800*	36600
230	36000	-3	37700*	37700*	37700*	37700*	37500
220	36900	-3	38600*	38600*	38600*	38600*	38500
210	37900	-3	39500*	39500*	39500*	39500*	39400
200	38900	-3	40500*	40500*	40500*	40500*	40400
190	40000	-3	41500*	41500*	41500*	41500*	41500
180	41100	-3	42600*	42600*	42600*	42600*	42600
170	42300	-3	43000	43000	43000	43000	43000
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 25	27	29	31	33	35	37	39	41	43
300	EPR	1.106	1.131	1.168	1.229	1.326					
	MACH	.772	.802	.834	.840	.838					
	KIAS	325	325	325	314	300					
	FF/ENG	4499	4533	4621	4641	4746					
280	EPR	1.083	1.106	1.135	1.182	1.247	1.365				
	MACH	.772	.802	.834	.841	.839	.838				
	KIAS	325	325	325	314	300	287				
	FF/ENG	4289	4321	4375	4343	4305	4482				
260	EPR	1.064	1.085	1.111	1.142	1.193	1.266	1.412			
	MACH	.770	.796	.821	.838	.841	.839	.839			
	KIAS	324	322	319	313	301	287	274			
	FF/ENG	4095	4094	4085	4045	3988	3985	4261			
240	EPR	1.047	1.066	1.088	1.115	1.148	1.201	1.284			
	MACH	.746	.772	.799	.823	.839	.840	.839			
	KIAS	313	312	310	307	300	287	274			
	FF/ENG	3762	3759	3758	3747	3705	3645	3691			
220	EPR	1.033	1.048	1.068	1.090	1.118	1.153	1.209	1.297		
	MACH	.721	.746	.773	.800	.825	.840	.840	.839		
	KIAS	302	300	299	297	294	287	274	261		
	FF/ENG	3437	3429	3427	3425	3413	3372	3337	3416		
200	EPR	1.021	1.033	1.048	1.068	1.090	1.118	1.155	1.212	1.300	
	MACH	.695	.719	.745	.772	.799	.825	.840	.840	.839	
	KIAS	290	289	287	286	284	281	274	262	249	
	FF/ENG	3123	3108	3100	3098	3095	3085	3065	3054	3127	
180	EPR	1.009	1.020	1.032	1.047	1.066	1.089	1.117	1.153	1.208	1.293
	MACH	.667	.690	.714	.740	.768	.796	.822	.839	.840	.839
	KIAS	278	276	275	273	272	270	268	262	250	238
	FF/ENG	2881	2853	2834	2775	2772	2770	2779	2784	2773	2826
160	EPR	1.000	1.008	1.018	1.030	1.044	1.063	1.085	1.114	1.147	1.199
	MACH	.636	.659	.682	.707	.733	.761	.790	.817	.837	.841
	KIAS	264	263	261	260	259	257	256	254	249	239
	FF/ENG	2589	2558	2532	2463	2454	2449	2464	2494	2505	2500

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
283	262	243	226	213	200	191	182	174	167	161
567	524	485	453	425	400	382	366	351	337	324
851	786	729	680	638	600	573	549	526	505	486
1136	1050	974	908	851	800	764	732	701	673	648
1423	1314	1218	1136	1064	1000	956	914	876	842	810
1711	1580	1463	1364	1277	1200	1147	1097	1052	1010	972
2000	1846	1709	1592	1491	1400	1337	1279	1226	1177	1133
2290	2112	1954	1820	1704	1600	1528	1462	1401	1345	1295
2581	2380	2201	2049	1918	1800	1720	1645	1576	1513	1456
2874	2649	2449	2279	2132	2000	1910	1827	1751	1680	1617

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.6	0:39	3.1	0:37	2.6	0:36	2.3	0:35	2.0	0:34
400	7.6	1:14	6.8	1:11	5.9	1:06	5.3	1:04	4.8	1:01
600	11.5	1:50	10.5	1:44	9.1	1:37	8.4	1:33	7.6	1:29
800	15.4	2:26	14.2	2:18	12.4	2:09	11.4	2:03	10.4	1:57
1000	19.4	3:02	17.9	2:53	15.6	2:40	14.4	2:33	13.2	2:26
1200	23.3	3:38	21.5	3:27	18.8	3:12	17.4	3:03	16.0	2:54
1400	27.1	4:15	25.1	4:02	21.9	3:44	20.3	3:33	18.7	3:23
1600	31.0	4:53	28.7	4:37	25.1	4:16	23.2	4:03	21.5	3:51
1800	34.7	5:30	32.2	5:13	28.2	4:48	26.1	4:34	24.2	4:20
2000	38.5	6:08	35.7	5:49	31.2	5:21	29.0	5:04	26.9	4:49

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
5	-0.3	-0.2	0.0	0.2	0.5	0.7	1.0	1.2
10	-0.7	-0.4	0.0	0.5	1.1	1.6	2.2	2.7
15	-1.1	-0.6	0.0	0.8	1.7	2.5	3.4	4.2
20	-1.6	-0.8	0.0	1.1	2.2	3.4	4.5	5.7
25	-2.0	-1.0	0.0	1.4	2.8	4.2	5.7	7.1
30	-2.5	-1.2	0.0	1.6	3.3	5.0	6.7	8.5
35	-3.0	-1.4	0.0	1.8	3.8	5.7	7.8	9.9
40	-3.4	-1.7	0.0	2.0	4.2	6.5	8.8	11.3

Long Range Cruise Enroute Fuel and Time - High Altitude

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
525	495	467	442	420	400	383	368	353	340	328
1045	985	931	883	840	800	767	737	709	683	659
1566	1477	1396	1324	1259	1200	1152	1107	1065	1026	991
2089	1970	1862	1766	1679	1600	1536	1476	1420	1369	1322
2614	2465	2329	2208	2100	2000	1920	1845	1776	1712	1653
3141	2961	2797	2651	2520	2400	2304	2215	2131	2054	1984
3670	3458	3265	3094	2941	2800	2688	2584	2486	2397	2315
4201	3957	3735	3538	3362	3200	3072	2952	2842	2739	2645
4734	4457	4206	3983	3783	3600	3456	3321	3196	3081	2975
5269	4959	4677	4428	4205	4000	3840	3690	3551	3423	3305
5806	5463	5151	4874	4627	4400	4223	4058	3905	3764	3634
6346	5968	5625	5321	5049	4800	4607	4426	4259	4104	3962
6888	6475	6100	5768	5471	5200	4990	4794	4612	4444	4290
7433	6984	6576	6216	5894	5600	5373	5161	4964	4783	4617
7981	7495	7054	6665	6317	6000	5756	5528	5316	5121	4943
8532	8008	7533	7114	6741	6400	6138	5894	5668	5460	5269
9086	8523	8013	7565	7165	6800	6521	6261	6020	5797	5594
9643	9041	8496	8017	7589	7200	6903	6627	6370	6134	5918
10204	9561	8980	8469	8014	7600	7285	6992	6721	6470	6241
10769	10084	9465	8922	8440	8000	7667	7357	7070	6806	6564

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37 & ABOVE	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
400	4.7	1:01	4.5	0:60	4.4	0:59	4.2	0:58	4.1	0:57
800	10.2	1:56	9.9	1:53	9.6	1:51	9.3	1:49	9.0	1:47
1200	15.6	2:52	15.1	2:48	14.7	2:44	14.3	2:40	13.9	2:38
1600	21.0	3:49	20.3	3:43	19.7	3:37	19.2	3:32	18.7	3:28
2000	26.4	4:45	25.4	4:38	24.7	4:31	24.0	4:24	23.5	4:19
2400	31.6	5:44	30.3	5:35	29.5	5:26	28.7	5:18	28.1	5:10
2800	36.7	6:42	35.3	6:31	34.3	6:21	33.4	6:11	32.6	6:02
3200	41.8	7:41	40.1	7:29	39.0	7:16	38.0	7:05	37.1	6:54
3600	46.7	8:41	44.9	8:27	43.6	8:13	42.4	7:60	41.5	7:47
4000	51.7	9:42	49.6	9:25	48.2	9:09	46.9	8:55	45.8	8:40
4400	56.4	10:44	54.2	10:25	52.7	10:08	51.3	9:51	50.1	9:35
4800	61.2	11:46	58.8	11:25	57.2	11:06	55.6	10:47	54.4	10:29
5200	65.8	12:49	63.3	12:26	61.6	12:05	59.9	11:45	58.5	11:24
5600	70.4	13:53	67.8	13:28	65.8	13:05	64.1	12:43	62.6	12:20
6000	74.9	14:57	72.2	14:30	70.1	14:05	68.2	13:41	66.7	13:16
6400	79.4	16:04	76.4	15:34	74.2	15:07	72.2	14:41	70.6	14:14
6800	83.9	17:11	80.7	16:39	78.3	16:09	76.2	15:40	74.4	15:11
7200	88.3	18:19	84.9	17:44	82.4	17:12	80.1	16:41	78.3	16:10
7600	92.6	19:28	89.0	18:50	86.3	18:16	83.9	17:43	82.0	17:09
8000	96.9	20:38	93.2	19:57	90.3	19:20	87.8	18:45	85.7	18:09

Long Range Cruise Enroute Fuel and Time - High Altitude

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.1	-0.5	0.0	0.6	2.1	6.3	12.7	21.3
20	-2.1	-1.1	0.0	1.1	4.0	9.5	17.3	27.5
30	-3.1	-1.6	0.0	1.7	5.7	12.3	21.4	32.9
40	-4.2	-2.1	0.0	2.4	7.4	14.9	24.9	37.5
50	-5.3	-2.7	0.0	3.1	8.8	17.1	28.0	41.4
60	-6.4	-3.2	0.0	3.8	10.2	19.1	30.5	44.5
70	-7.5	-3.8	0.0	4.5	11.4	20.7	32.6	46.8
80	-8.6	-4.3	0.0	5.1	12.4	22.1	34.1	48.4
90	-9.7	-4.9	0.0	5.6	13.4	23.2	35.1	49.2
100	-10.9	-5.4	0.0	6.1	14.1	24.0	35.7	49.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)						
	260	240	220	200	180	160	140
43				43	10	0	7
41			42	12	0	3	19
39		38	12	0	2	14	33
37	32	10	0	1	11	28	49
35	7	0	1	10	24	43	64
33	0	2	10	23	39	58	78
31	3	10	22	37	54	72	91
29	12	23	36	52	68	85	102
27	24	37	51	66	81	97	112
25	38	51	65	79	93	107	121

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent at .84/310/250 KIAS

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	93	100	107	114	119	124	130	136	142	148
TIME (MINUTES)	19	20	21	22	23	23	24	25	25	26

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	EPR	1.023	1.031	1.047	1.059	1.075	1.123	1.198			
	KIAS	260	260	262	277	302	306	311			
	FF/ENG	4350	4320	4190	4230	4440	4530	4710			
280	EPR	1.020	1.027	1.040	1.055	1.067	1.108	1.169	1.356		
	KIAS	251	251	253	261	286	295	299	279		
	FF/ENG	4060	4020	3890	3890	4060	4180	4300	4550		
260	EPR	1.017	1.023	1.034	1.052	1.063	1.092	1.145	1.265		
	KIAS	242	242	243	246	266	283	287	279		
	FF/ENG	3770	3720	3690	3580	3740	3830	3920	4060		
240	EPR	1.014	1.019	1.029	1.045	1.059	1.074	1.124	1.203		
	KIAS	232	233	234	235	247	272	275	279		
	FF/ENG	3560	3510	3460	3350	3380	3490	3560	3710		
220	EPR	1.010	1.015	1.024	1.037	1.055	1.066	1.105	1.167	1.357	
	KIAS	223	223	224	224	230	251	262	266	249	
	FF/ENG	3280	3230	3170	3140	3050	3160	3220	3310	3590	
200	EPR	1.006	1.009	1.017	1.028	1.047	1.061	1.084	1.138	1.249	
	KIAS	216	216	216	216	216	229	249	253	249	
	FF/ENG	3010	2960	2890	2850	2760	2800	2880	2950	3130	
180	EPR	1.001	1.004	1.010	1.019	1.033	1.056	1.068	1.113	1.186	1.289
	KIAS	209	209	209	209	209	209	230	239	242	232
	FF/ENG	2820	2700	2630	2580	2550	2470	2570	2600	2770	2870
160	EPR	0.997	0.999	1.004	1.010	1.022	1.039	1.062	1.088	1.147	1.202
	KIAS	202	202	202	202	202	202	206	224	227	229
	FF/ENG	2570	2510	2380	2320	2290	2260	2220	2320	2440	2560
140	EPR	0.994	0.996	0.998	1.003	1.011	1.025	1.044	1.069	1.115	1.154
	KIAS	194	194	194	194	194	194	194	202	211	213
	FF/ENG	2330	2260	2190	2080	2040	2000	1940	1970	2100	2170

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding

Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.057	1.070	1.096	1.134	1.192
	KIAS	228	228	228	228	228
	FF/ENG	4680	4530	4520	4540	4570
280	EPR	1.050	1.061	1.083	1.118	1.168
	KIAS	222	222	222	222	222
	FF/ENG	4350	4310	4180	4200	4210
260	EPR	1.043	1.053	1.071	1.101	1.145
	KIAS	216	216	216	216	216
	FF/ENG	4030	3990	3850	3850	3930
240	EPR	1.036	1.045	1.061	1.085	1.123
	KIAS	209	209	209	209	209
	FF/ENG	3720	3680	3630	3590	3600
220	EPR	1.029	1.037	1.051	1.071	1.103
	KIAS	203	203	203	203	203
	FF/ENG	3480	3440	3380	3270	3270
200	EPR	1.023	1.029	1.042	1.057	1.084
	KIAS	196	196	196	196	196
	FF/ENG	3180	3140	3080	3040	2950
180	EPR	1.017	1.022	1.033	1.046	1.066
	KIAS	189	189	189	189	189
	FF/ENG	2960	2840	2790	2740	2650
160	EPR	1.012	1.016	1.024	1.035	1.050
	KIAS	182	182	182	182	182
	FF/ENG	2670	2620	2500	2450	2410
140	EPR	1.008	1.011	1.016	1.025	1.037
	KIAS	174	174	174	174	174
	FF/ENG	2400	2340	2270	2170	2120

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Advisory Information — Section 22

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	180000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 180000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	830	+25/-15	15	-35	125	10	-10	15	-15	65	10	25
MAX AUTO	1100	+20/-15	25	-50	175	0	0	25	-25	115	0	0
AUTOBRAKE 4	1350	+30/-20	35	-65	245	0	-5	35	-35	145	0	0
AUTOBRAKE 3	1620	+35/-30	45	-85	305	10	-10	45	-45	175	0	5
AUTOBRAKE 2	1810	+40/-35	50	-95	355	15	-35	50	-50	160	15	15
AUTOBRAKE 1	1930	+45/-40	60	-105	395	40	-50	50	-50	155	110	110

Good Reported Braking Action

MAX MANUAL	1130	+20/-20	30	-55	220	30	-25	25	-25	95	50	115
MAX AUTO	1240	+25/-25	30	-60	225	20	-15	25	-30	110	55	125
AUTOBRAKE 4	1350	+30/-30	35	-70	250	5	-10	35	-35	145	5	25
AUTOBRAKE 3	1620	+35/-35	45	-85	305	10	-10	45	-45	175	0	5

Medium Reported Braking Action

MAX MANUAL	1505	+35/-35	45	-90	360	70	-55	35	-35	120	145	370
MAX AUTO	1590	+35/-35	45	-90	360	65	-40	35	-35	140	140	370
AUTOBRAKE 4	1590	+35/-35	45	-90	360	65	-45	40	-40	135	155	395
AUTOBRAKE 3	1695	+40/-35	45	-95	385	45	-30	45	-45	175	75	270

Poor Reported Braking Action

MAX MANUAL	1915	+50/-45	60	-130	575	175	-100	50	-50	135	320	905
MAX AUTO	2030	+50/-45	60	-130	570	175	-100	50	-50	135	325	915
AUTOBRAKE 4	2030	+50/-45	60	-130	570	170	-105	50	-50	135	330	930
AUTOBRAKE 3	2030	+50/-45	60	-135	575	170	-85	50	-50	170	320	920

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	180000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 180000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	870	+25/-15	20	-35	130	10	-10	20	-20	65	15	30
MAX AUTO	1175	+20/-15	25	-50	185	0	0	30	-30	120	0	0
AUTOBRAKE 4	1450	+30/-20	40	-70	255	0	-5	40	-40	155	0	0
AUTOBRAKE 3	1750	+40/-30	45	-90	315	15	-15	50	-50	175	5	5
AUTOBRAKE 2	1945	+45/-40	55	-100	365	25	-45	50	-50	155	40	45
AUTOBRAKE 1	2045	+50/-45	65	-110	405	55	-60	55	-55	155	160	170

Good Reported Braking Action

MAX MANUAL	1185	+25/-25	30	-60	225	30	-25	25	-30	95	60	140
MAX AUTO	1310	+25/-25	30	-60	230	20	-15	30	-30	115	65	150
AUTOBRAKE 4	1450	+30/-30	40	-70	260	5	-10	40	-40	155	5	25
AUTOBRAKE 3	1745	+40/-40	45	-90	315	15	-15	50	-50	175	5	5

Medium Reported Braking Action

MAX MANUAL	1580	+35/-35	45	-90	370	70	-55	40	-40	120	170	435
MAX AUTO	1675	+35/-35	45	-90	365	65	-45	40	-40	140	160	430
AUTOBRAKE 4	1675	+35/-35	45	-90	370	65	-40	40	-40	150	165	450
AUTOBRAKE 3	1820	+40/-40	50	-100	395	45	-35	50	-50	175	70	295

Poor Reported Braking Action

MAX MANUAL	2000	+50/-50	65	-135	580	175	-105	50	-50	135	365	1050
MAX AUTO	2130	+50/-45	65	-135	575	175	-105	50	-50	135	365	1065
AUTOBRAKE 4	2130	+50/-50	65	-135	580	170	-105	50	-50	135	370	1080
AUTOBRAKE 3	2130	+50/-45	65	-135	585	170	-85	55	-55	175	340	1050

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	180000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 180000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	905	+30/-15	20	-35	125	10	-10	20	-20	70	15	35
MAX AUTO	1225	+25/-25	30	-55	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1520	+30/-35	40	-75	250	0	-5	40	-40	165	0	0
AUTOBRAKE 3	1815	+40/-40	50	-90	315	10	-20	50	-50	185	5	5
AUTOBRAKE 2	2000	+50/-50	60	-105	360	30	-45	55	-55	170	45	45
AUTOBRAKE 1	2110	+55/-55	70	-115	400	55	-65	60	-60	165	170	175

Good Reported Braking Action

MAX MANUAL	1245	+25/-25	30	-60	215	30	-25	30	-30	100	65	160
MAX AUTO	1305	+25/-25	35	-65	225	20	-15	30	-30	120	75	175
AUTOBRAKE 4	1525	+35/-35	40	-75	260	5	-10	40	-40	165	5	25
AUTOBRAKE 3	1815	+40/-40	50	-90	315	10	-20	50	-50	185	5	5

Medium Reported Braking Action

MAX MANUAL	1665	+40/-40	50	-95	355	70	-60	40	-40	125	195	510
MAX AUTO	1665	+40/-40	50	-95	350	65	-45	40	-40	140	185	505
AUTOBRAKE 4	1685	+40/-40	50	-95	355	60	-40	45	-45	155	190	530
AUTOBRAKE 3	1895	+45/-45	55	-105	385	40	-35	50	-50	185	80	350

Poor Reported Braking Action

MAX MANUAL	2120	+55/-50	70	-140	550	165	-110	55	-55	145	415	1245
MAX AUTO	2120	+55/-50	70	-140	545	165	-110	55	-55	140	420	1260
AUTOBRAKE 4	2120	+55/-55	70	-140	545	160	-110	55	-55	145	425	1275
AUTOBRAKE 3	2150	+55/-50	70	-140	555	150	-90	55	-55	180	390	1245

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 65 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1580	35/-35	50	-90/355	75/-55	20/-20	120	170	435
ANTISKID (FLAPS 30)	VREF30	1505	35/-35	45	-90/345	70/-50	20/-20	120	145	370
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	915	25/-15	20	-35/130	10/-10	10/-10	75	-	20
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	835	25/-15	20	-35/125	10/-10	10/-10	70	-	10
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1060	40/-15	25	-45/150	15/-10	15/-15	75	30	65
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	960	25/-15	20	-35/135	10/-10	10/-10	65	20	45
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	905	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLAPS PRIMARY FAIL	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
FLAP/SLAT CONTROL	VREF20	900	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLIGHT CONTROL MODE	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
HYD PRESS SYS C	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
HYD PRESS SYS L+C	VREF30+20	1165	25/-20	25	-45/160	20/-15	15/-15	110	-	35
HYD PRESS SYS L+R	VREF30+20	1255	25/-20	30	-55/190	30/-25	20/-20	130	-	-
HYD PRESS SYS R+C	VREF30+20	1440	25/-25	35	-65/220	35/-30	20/-20	150	-	90
HYD PRESS SYS L (FLAPS 25)	VREF25	920	25/-15	20	-40/135	10/-10	10/-10	80	-	20
HYD PRESS SYS L (FLAPS 30)	VREF30	880	25/-15	20	-35/130	10/-10	10/-10	80	-	15
HYD PRESS SYS R (FLAPS 25)	VREF25	1015	20/-15	25	-45/160	20/-15	10/-10	95	-	30
HYD PRESS SYS R (FLAPS 30)	VREF30	960	15/-15	20	-45/155	20/-15	10/-10	90	-	25
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1055	35/-15	25	-45/145	10/-10	15/-15	65	25	60
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	935	25/-15	20	-35/135	10/-10	10/-10	65	20	40
PRI FLIGHT COMPUTERS	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
SLATS DRIVE	VREF30+30	1050	25/-15	25	-40/140	10/-10	10/-10	75	25	50
STABILIZER	VREF30+20	975	25/-15	20	-35/135	10/-10	10/-10	70	20	45

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1580	35/-35	50	-90/355	75/-55	20/-20	120	170	435
ANTISKID (FLAPS 30)	VREF30	1505	35/-35	45	-90/345	70/-50	20/-20	120	145	370
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1295	25/-25	35	-65/225	35/-30	20/-20	105	-	85
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1165	25/-25	30	-60/220	30/-25	15/-15	100	-	60
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1490	25/-25	45	-65/240	35/-30	20/-20	95	105	255
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1335	25/-25	35	-60/225	30/-25	20/-20	100	85	205
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1245	25/-25	35	-60/220	30/-25	15/-15	95	65	160
FLAPS PRIMARY FAIL	VREF20	1375	25/-25	35	-65/235	35/-30	20/-20	115	80	195
FLAP/SLAT CONTROL	VREF20	1235	25/-25	35	-60/215	30/-25	15/-15	95	65	150
FLIGHT CONTROL MODE	VREF20	1415	30/-30	35	-65/240	35/-30	20/-20	125	90	220
HYD PRESS SYS C	VREF20	1375	25/-25	35	-65/235	35/-30	20/-20	115	80	195
HYD PRESS SYS L+C	VREF30+20	1670	30/-30	50	-80/275	55/-45	25/-25	155	-	165
HYD PRESS SYS L+R	VREF30+20	1740	35/-35	50	-85/300	75/-60	25/-25	175	-	-
HYD PRESS SYS R+C	VREF30+20	1710	35/-35	50	-80/285	60/-50	25/-25	170	-	180
HYD PRESS SYS L (FLAPS 25)	VREF25	1320	25/-25	35	-65/240	45/-35	20/-20	120	-	100
HYD PRESS SYS L (FLAPS 30)	VREF30	1250	25/-25	35	-65/240	40/-35	20/-20	120	-	80
HYD PRESS SYS R (FLAPS 25)	VREF25	1320	25/-25	35	-65/240	45/-35	20/-20	120	-	100
HYD PRESS SYS R (FLAPS 30)	VREF30	1240	25/-25	35	-65/235	40/-30	20/-20	120	-	80
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1475	25/-25	40	-65/230	30/-25	20/-20	90	95	225
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1290	25/-25	35	-60/220	30/-25	20/-20	90	70	160
PRI FLIGHT COMPUTERS	VREF20	1415	30/-30	35	-65/240	35/-30	20/-20	125	90	220
SLATS DRIVE	VREF30+30	1450	25/-25	40	-65/240	35/-30	20/-20	100	90	215
STABILIZER	VREF30+20	1345	25/-25	35	-60/230	35/-25	20/-20	100	80	190

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2000	50/-45	65	-135/560	175/-105	25/-25	135	365	1050
ANTISKID (FLAPS 30)	VREF30	1915	50/-45	65	-130/550	175/-105	25/-25	135	325	900
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1815	45/-45	55	-105/385	100/-75	25/-25	140	-	290
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1610	35/-35	45	-100/370	85/-65	25/-25	130	-	205
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2015	45/-45	65	-105/390	80/-65	30/-30	125	295	825
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1785	40/-40	55	-95/365	75/-60	25/-25	120	240	650
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1665	40/-40	50	-90/360	75/-60	25/-25	120	195	510
FLAPS PRIMARY FAIL	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230	615
FLAP/SLAT CONTROL	VREF20	1645	35/-35	50	-90/355	70/-55	25/-25	120	185	485
FLIGHT CONTROL MODE	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255	695
HYD PRESS SYS C	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230	615
HYD PRESS SYS L+C	VREF30+20	2345	50/-50	80	-130/470	145/-105	35/-35	200	-	525
HYD PRESS SYS L+R	VREF30+20	2730	55/-55	80	-155/560	265/-170	45/-45	245	-	-
HYD PRESS SYS R+C	VREF30+20	2395	55/-50	75	-130/480	160/-115	35/-35	215	-	565
HYD PRESS SYS L (FLAPS 25)	VREF25	1860	45/-40	60	-110/420	115/-80	25/-25	155	-	325
HYD PRESS SYS L (FLAPS 30)	VREF30	1770	40/-40	50	-105/410	115/-80	25/-25	160	-	275
HYD PRESS SYS R (FLAPS 25)	VREF25	1850	45/-40	55	-110/420	115/-80	25/-25	155	-	315
HYD PRESS SYS R (FLAPS 30)	VREF30	1730	40/-35	50	-105/405	110/-75	25/-25	150	-	255
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1965	40/-40	60	-100/380	75/-60	25/-25	115	255	685
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1725	35/-35	50	-95/360	70/-55	25/-25	115	195	500
PRI FLIGHT COMPUTERS	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255	695
SLATS DRIVE	VREF30+30	1920	40/-40	60	-100/380	80/-65	25/-25	125	240	630
STABILIZER	VREF30+20	1790	40/-40	55	-100/370	75/-60	25/-25	120	215	570

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2715	75/-70	100	-230/1120	700/-255	40/-40	150	1010	5000
ANTISKID (FLAPS 30)	VREF30	2610	75/-65	95	-230/1110	670/-250	35/-35	150	925	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2430	65/-65	80	-160/620	255/-150	35/-35	170	-	730
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2145	55/-55	65	-145/605	225/-135	35/-35	155	-	510
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2565	65/-60	95	-150/605	200/-120	35/-35	150	620	2050
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2265	55/-55	75	-140/580	185/-110	35/-35	145	500	1585
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2120	55/-55	70	-135/560	170/-105	30/-30	140	420	1240
FLAPS PRIMARY FAIL	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
FLAP/SLAT CONTROL	VREF20	2090	55/-55	70	-135/555	170/-105	30/-30	135	400	1175
FLIGHT CONTROL MODE	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
HYD PRESS SYS C	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
HYD PRESS SYS L+C	VREF30+20	3160	75/-75	110	-200/780	395/-225	50/-50	230	-	1340
HYD PRESS SYS L+R	VREF30+20	4240	85/-80	120	-275/1075	1120/-440	75/-75	310	-	-
HYD PRESS SYS R+C	VREF30+20	3200	75/-75	115	-200/790	445/-230	50/-50	245	-	1400
HYD PRESS SYS L (FLAPS 25)	VREF25	2525	65/-60	80	-175/705	340/-175	40/-40	185	-	840
HYD PRESS SYS L (FLAPS 30)	VREF30	2415	60/-55	80	-170/700	340/-175	35/-35	185	-	730
HYD PRESS SYS R (FLAPS 25)	VREF25	2490	65/-60	80	-175/705	330/-175	40/-40	180	-	805
HYD PRESS SYS R (FLAPS 30)	VREF30	2330	55/-55	75	-165/685	315/-160	35/-35	175	-	655
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2475	55/-55	85	-145/595	175/-115	35/-35	130	525	1605
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2185	55/-55	75	-135/575	170/-105	30/-30	130	410	1200
PRI FLIGHT COMPUTERS	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
SLATS DRIVE	VREF30+30	2410	55/-55	80	-145/585	185/-120	35/-35	140	490	1445
STABILIZER	VREF30+20	2255	55/-55	75	-140/575	175/-115	35/-35	140	450	1335

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	258.6	243.7				
52	126	264.6	249.6				
50	122	270.9	255.3	236.3			
48	118	277.2	261.0	242.0			
46	115	283.6	266.6	247.5	227.9		
44	111	289.9	272.9	253.0	232.3		
42	108	294.5	279.4	258.3	236.5	219.7	
40	104	298.9	285.7	263.4	240.9	223.4	
38	100	303.1	290.9	268.8	244.9	226.8	209.6
36	97	307.2	296.1	273.9	249.0	230.3	212.9
34	93	311.2	300.9	278.2	253.1	233.7	216.1
32	90	311.3	305.3	282.4	256.9	237.2	219.3
30	86	311.3	309.7	286.6	260.6	240.8	222.4
28	82	311.4	309.7	290.4	264.4	244.5	225.8
26	79	311.4	309.7	294.1	267.9	248.0	229.2
24	75	311.5	309.8	294.9	271.1	251.4	232.5
22	72	311.6	309.8	294.9	274.2	253.5	234.1
20	68	311.6	309.9	294.9	274.8	254.5	235.5
18	64	311.6	309.9	295.0	274.9	255.6	237.2
16	61	311.6	310.0	295.1	274.9	256.1	239.0
14	57	311.7	310.0	295.1	275.0	256.1	240.5
12	54	311.7	310.1	295.2	275.0	256.2	240.6
10	50	311.8	310.2	295.2	275.1	256.2	240.7
-40	-40	312.9	311.5	296.6	276.3	257.3	241.7

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 900 kg.
With engine and wing anti-ice on, decrease weight by 1450 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature is below 10°C, decrease weight by 20800 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
300	0	17.3	19.1	21.2	26.1	29.1	32.6	36.4	40.8	46.0	47.9	53.9	61.0	60.4	68.1	77.1	73.2	82.4	93.0
	10	17.9	19.7	21.8	27.0	30.0	33.7	37.6	42.1	47.5	49.5	55.7	63.0	62.4	70.4	79.6	75.6	85.0	95.8
	15	18.2	20.0	22.2	27.4	30.5	34.2	38.2	42.9	48.3	50.3	56.7	64.1	63.5	71.5	80.8	76.8	86.3	97.2
	20	18.4	20.3	22.5	27.9	31.0	34.8	38.9	43.6	49.1	51.2	57.6	65.1	64.5	72.7	82.1	78.0	87.6	98.5
	30	18.8	20.8	23.1	28.6	31.8	35.7	39.9	44.7	50.5	52.6	59.2	66.9	66.3	74.7	84.3	80.2	90.0	101.1
	40	19.1	21.0	23.4	29.0	32.4	36.3	40.6	45.6	51.5	53.7	60.5	68.4	67.8	76.4	86.3	82.0	92.0	103.3
280	0	16.4	18.0	20.0	24.7	27.4	30.7	34.3	38.4	43.2	45.1	50.7	57.3	56.9	64.1	72.6	69.0	77.8	87.9
	10	16.9	18.6	20.6	25.5	28.3	31.7	35.4	39.7	44.7	46.6	52.4	59.3	58.8	66.3	74.9	71.3	80.3	90.6
	15	17.2	18.9	20.9	25.9	28.8	32.2	36.0	40.4	45.5	47.4	53.3	60.3	59.8	67.4	76.2	72.5	81.6	92.0
	20	17.4	19.2	21.3	26.3	29.3	32.8	36.6	41.0	46.2	48.2	54.2	61.2	60.7	68.5	77.3	73.6	82.8	93.3
	30	17.8	19.6	21.8	27.0	30.0	33.6	37.6	42.1	47.5	49.5	55.7	63.0	62.5	70.4	79.5	75.7	85.1	95.8
	40	18.0	19.8	22.0	27.4	30.5	34.2	38.3	42.9	48.4	50.5	56.9	64.4	63.8	72.0	81.3	77.4	87.0	97.9
260	0	15.5	17.0	18.8	23.2	25.8	28.8	32.2	36.0	40.5	42.3	47.5	53.7	53.3	60.0	67.9	64.7	73.0	82.6
	10	15.9	17.5	19.4	24.0	26.6	29.7	33.3	37.2	41.9	43.7	49.1	55.5	55.0	62.0	70.2	66.9	75.4	85.1
	15	16.2	17.8	19.7	24.4	27.0	30.2	33.8	37.8	42.6	44.4	49.9	56.4	56.0	63.1	71.3	68.0	76.6	86.5
	20	16.5	18.1	20.0	24.8	27.5	30.7	34.4	38.5	43.3	45.2	50.8	57.3	56.9	64.1	72.5	69.1	77.8	87.8
	30	16.8	18.5	20.4	25.4	28.2	31.5	35.3	39.5	44.5	46.4	52.2	58.9	58.5	65.9	74.5	71.0	79.9	90.1
	40	17.0	18.7	20.7	25.7	28.6	32.0	35.9	40.2	45.3	47.3	53.3	60.2	59.8	67.4	76.2	72.6	81.8	92.2
240	0	14.6	15.9	17.6	21.8	24.1	26.9	30.1	33.6	37.8	39.4	44.2	49.9	49.6	55.8	63.2	60.3	68.0	76.9
	10	15.0	16.4	18.1	22.5	24.9	27.8	31.1	34.7	39.0	40.7	45.7	51.6	51.2	57.7	65.3	62.3	70.2	79.4
	15	15.2	16.7	18.4	22.8	25.3	28.3	31.6	35.3	39.7	41.4	46.5	52.5	52.1	58.7	66.3	63.3	71.4	80.7
	20	15.5	16.9	18.7	23.2	25.7	28.7	32.1	35.9	40.3	42.1	47.3	53.3	53.0	59.7	67.4	64.4	72.5	81.9
	30	15.8	17.3	19.2	23.7	26.3	29.4	32.9	36.8	41.4	43.2	48.6	54.8	54.4	61.3	69.3	66.2	74.6	84.2
	40	15.9	17.5	19.4	24.1	26.7	29.9	33.5	37.5	42.2	44.1	49.6	56.0	55.6	62.7	70.9	67.7	76.3	86.1
220	0	13.6	14.9	16.4	20.3	22.4	25.0	28.0	31.2	35.0	36.5	40.9	46.1	45.8	51.6	58.3	55.7	62.8	71.1
	10	14.1	15.4	16.9	20.9	23.2	25.8	28.9	32.2	36.1	37.7	42.3	47.7	47.3	53.3	60.2	57.6	64.9	73.4
	15	14.3	15.6	17.2	21.3	23.5	26.2	29.4	32.7	36.7	38.4	43.0	48.5	48.2	54.2	61.2	58.5	66.0	74.6
	20	14.5	15.9	17.5	21.6	23.9	26.7	29.8	33.3	37.3	39.0	43.7	49.3	49.0	55.1	62.2	59.5	67.0	75.8
	30	14.8	16.2	17.9	22.1	24.5	27.3	30.6	34.1	38.3	40.0	44.9	50.6	50.3	56.6	64.0	61.2	68.9	77.9
	40	14.9	16.3	18.1	22.4	24.8	27.7	31.1	34.7	39.0	40.8	45.8	51.7	51.3	57.9	65.4	62.5	70.5	79.7
200	0	12.7	13.9	15.3	18.8	20.8	23.1	25.8	28.7	32.2	33.6	37.5	42.3	42.0	47.2	53.3	51.0	57.4	65.0
	10	13.1	14.3	15.7	19.4	21.4	23.8	26.6	29.6	33.2	34.7	38.8	43.7	43.4	48.8	55.1	52.7	59.4	67.1
	15	13.3	14.5	16.0	19.7	21.8	24.2	27.1	30.1	33.8	35.2	39.5	44.4	44.1	49.6	56.0	53.6	60.4	68.2
	20	13.5	14.8	16.3	20.0	22.1	24.6	27.5	30.6	34.3	35.8	40.1	45.2	44.9	50.4	56.9	54.5	61.3	69.3
	30	13.8	15.1	16.6	20.5	22.6	25.2	28.2	31.4	35.2	36.8	41.2	46.4	46.1	51.8	58.5	56.0	63.1	71.3
	40	13.9	15.2	16.8	20.8	22.9	25.6	28.6	31.9	35.8	37.4	42.0	47.3	47.0	52.9	59.8	57.2	64.5	72.9
180	0	11.8	12.9	14.1	17.4	19.1	21.2	23.6	26.2	29.3	30.6	34.1	38.4	38.1	42.7	48.2	46.1	51.9	58.6
	10	12.2	13.3	14.6	17.9	19.7	21.9	24.4	27.1	30.3	31.6	35.3	39.6	39.3	44.1	49.8	47.6	53.6	60.6
	15	12.4	13.5	14.8	18.2	20.0	22.2	24.8	27.5	30.8	32.1	35.9	40.3	40.0	44.9	50.7	48.5	54.5	61.6
	20	12.6	13.7	15.0	18.5	20.3	22.6	25.2	28.0	31.3	32.6	36.4	41.0	40.7	45.6	51.5	49.2	55.4	62.6
	30	12.8	14.0	15.3	18.9	20.8	23.1	25.8	28.7	32.1	33.5	37.4	42.1	41.8	46.9	52.9	50.6	57.0	64.4
	40	12.9	14.1	15.5	19.1	21.1	23.4	26.2	29.1	32.6	34.0	38.1	42.9	42.6	47.8	54.0	51.7	58.2	65.8

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.
If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule
Event Adjusted Brake Energy (Millions of Foot Pounds)
No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	15.6	24.9	34.0	43.2	52.3	61.6	70.9	80.4
	MAX AUTO	6.1	14.4	22.8	31.3	40.0	49.0	58.2	67.7	77.6
	AUTOBRAKE 4	5.9	13.6	21.2	29.1	37.1	45.5	54.2	63.3	73.0
	AUTOBRAKE 3	5.6	12.7	19.7	26.9	34.2	41.9	49.8	58.3	67.3
	AUTOBRAKE 2	5.3	11.8	18.2	24.8	31.5	38.4	45.6	53.3	61.5
	AUTOBRAKE 1	5.2	11.0	16.8	22.8	28.9	35.2	41.9	48.9	56.4

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.8	14.7	23.4	32.0	40.4	48.8	57.2	65.6	74.2
	MAX AUTO	4.3	11.6	18.9	26.4	34.1	42.0	50.2	58.9	68.0
	AUTOBRAKE 4	3.6	9.2	15.0	21.1	27.5	34.4	41.7	49.6	58.2
	AUTOBRAKE 3	2.5	6.6	11.1	15.9	21.0	26.7	32.8	39.5	46.8
	AUTOBRAKE 2	1.4	4.4	7.6	11.3	15.3	19.7	24.5	29.8	35.6
	AUTOBRAKE 1	1.0	3.0	5.3	7.8	10.6	13.9	17.5	21.7	26.4

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.
Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.
Add 1.0 million foot pounds for each taxi mile.
For one brake deactivated, increase brake energy by 10 percent.
For two brakes deactivated, increase brake energy by 20 percent.
When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.
When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.
Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

Performance Inflight — Chapter PI
Engine Inoperative — Section 23

ENGINE INOP

Initial Max Continuous EPR
Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20 & ABOVE	1.243	1.234	1.226	1.211	1.192	1.183	1.181	1.175	1.170
15	1.284	1.275	1.263	1.250	1.232	1.222	1.220	1.216	1.212
10	1.327	1.319	1.307	1.288	1.273	1.264	1.262	1.259	1.257
5	1.364	1.366	1.354	1.337	1.314	1.306	1.304	1.302	1.300
0	1.364	1.402	1.406	1.388	1.368	1.355	1.354	1.351	1.349
-5	1.364	1.402	1.439	1.444	1.424	1.412	1.411	1.408	1.406
-10	1.364	1.402	1.439	1.473	1.482	1.471	1.469	1.467	1.465
-15	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518
-20 & BELOW	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off
37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	1.531	1.531	1.531	1.531	1.531	1.489	1.436	1.385	1.341	1.302	1.263	1.233
240	0.74	1.534	1.534	1.534	1.534	1.534	1.534	1.517	1.455	1.402	1.349	1.308	1.268
280	0.86	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.469	1.413	1.356	1.304
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	1.517	1.517	1.517	1.517	1.517	1.486	1.433	1.385	1.341	1.304	1.267	1.234
240	0.71	1.514	1.514	1.514	1.514	1.514	1.514	1.502	1.444	1.394	1.344	1.305	1.266
280	0.82	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.476	1.417	1.362	1.311
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.58	1.499	1.499	1.499	1.499	1.499	1.499	1.447	1.401	1.358	1.323	1.290	1.257
240	0.68	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.452	1.402	1.355	1.314	1.278
280	0.79	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.472	1.414	1.363	1.314
320	0.89	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.389	1.338
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	1.480	1.480	1.480	1.480	1.480	1.461	1.414	1.372	1.332	1.303	1.274	1.245
240	0.66	1.471	1.471	1.471	1.471	1.471	1.471	1.461	1.410	1.365	1.322	1.291	1.260
280	0.76	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.415	1.366	1.321	1.281
320	0.85	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.406	1.353	1.306
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	1.493	1.493	1.493	1.493	1.493	1.454	1.411	1.369	1.334	1.302	1.270	1.252
240	0.63	1.475	1.475	1.475	1.475	1.475	1.475	1.441	1.395	1.352	1.315	1.286	1.255
280	0.73	1.446	1.446	1.446	1.446	1.446	1.446	1.446	1.426	1.378	1.334	1.293	1.259
320	0.82	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.362	1.317	1.273
360	0.91	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.330	1.284

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	37	35	33	31	29
ENGINE ONLY	-0.004	-0.003	-0.003	-0.003	-0.003
ENGINE & WING*	-0.015	-0.014	-0.013	-0.012	-0.012
ENGINE & WING**	-0.026	-0.024	-0.022	-0.021	-0.020

*** Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

27000 FT to 20000 Pressure Altitudes

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.51	1.507	1.507	1.507	1.507	1.507	1.499	1.452	1.409	1.368	1.336	1.302	1.268
240	0.60	1.488	1.488	1.488	1.488	1.488	1.488	1.483	1.434	1.391	1.349	1.317	1.286
280	0.70	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.398	1.355	1.314	1.279
320	0.79	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.368	1.323	1.282
360	0.88	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.325	1.281
25000 FT PRESS ALT		**TAT (°C)**											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.49	1.521	1.521	1.521	1.521	1.521	1.496	1.450	1.407	1.369	1.337	1.303	1.278
240	0.58	1.502	1.502	1.502	1.502	1.502	1.502	1.477	1.431	1.389	1.350	1.316	1.282
280	0.67	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.430	1.384	1.344	1.305	1.273
320	0.76	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.380	1.335	1.296	1.257
360	0.85	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.288	1.249
24000 FT PRESS ALT		**TAT (°C)**											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.48	1.523	1.523	1.523	1.523	1.523	1.512	1.465	1.420	1.379	1.346	1.312	1.278
240	0.57	1.502	1.502	1.502	1.502	1.502	1.502	1.490	1.443	1.399	1.357	1.324	1.289
280	0.66	1.455	1.455	1.455	1.455	1.455	1.455	1.455	1.447	1.400	1.358	1.316	1.283
320	0.75	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.350	1.309	1.269
360	0.83	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.300	1.259
22000 FT PRESS ALT		**TAT (°C)**											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.46	1.523	1.523	1.523	1.523	1.523	1.496	1.449	1.404	1.364	1.330	1.295	1.271
240	0.55	1.505	1.505	1.505	1.505	1.505	1.505	1.473	1.426	1.380	1.341	1.307	1.273
280	0.63	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.433	1.387	1.342	1.302	1.269
320	0.72	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.385	1.340	1.297	1.255
360	0.80	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.329	1.287	1.246
20000 FT PRESS ALT		**TAT (°C)**											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.44	1.519	1.519	1.519	1.519	1.519	1.519	1.477	1.429	1.383	1.346	1.311	1.275
240	0.53	1.512	1.512	1.512	1.512	1.512	1.512	1.509	1.461	1.413	1.366	1.329	1.294
280	0.61	1.469	1.469	1.469	1.469	1.469	1.469	1.469	1.465	1.417	1.368	1.321	1.287
320	0.69	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.376	1.329	1.283
360	0.77	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.317	1.274

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	27	25	24	22	20
ENGINE ONLY	-0.004	-0.005	-0.006	-0.007	-0.006
ENGINE & WING*	-0.012	-0.012	-0.012	-0.013	-0.012
ENGINE & WING**	-0.019	-0.019	-0.019	-0.019	-0.018

*** Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

18000 FT to 5000 FT Pressure Altitudes

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.42	1.511	1.511	1.511	1.511	1.511	1.500	1.455	1.411	1.369	1.337	1.305	1.275
240	0.51	1.515	1.515	1.515	1.515	1.515	1.515	1.495	1.449	1.403	1.362	1.328	1.293
280	0.59	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.447	1.400	1.354	1.313	1.282
320	0.67	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.402	1.356	1.311	1.269
360	0.75	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.349	1.305	1.262
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	1.504	1.504	1.504	1.504	1.504	1.504	1.479	1.438	1.396	1.360	1.332	1.304
240	0.49	1.511	1.511	1.511	1.511	1.511	1.511	1.511	1.477	1.432	1.389	1.354	1.322
280	0.57	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.432	1.387	1.344	1.310
320	0.64	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.384	1.340	1.296
360	0.72	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.337	1.294
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
200	0.39	1.488	1.488	1.488	1.488	1.488	1.488	1.452	1.413	1.373	1.343	1.315	1.288
240	0.47	1.491	1.491	1.491	1.491	1.491	1.491	1.484	1.444	1.402	1.361	1.330	1.298
280	0.54	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.449	1.407	1.365	1.324	1.293
320	0.62	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.400	1.357	1.315	1.275
360	0.69	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.354	1.313	1.272
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.38	1.475	1.475	1.475	1.475	1.475	1.468	1.431	1.393	1.355	1.329	1.302	1.276
240	0.45	1.473	1.473	1.473	1.473	1.473	1.473	1.453	1.415	1.375	1.339	1.308	1.277
280	0.52	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.424	1.385	1.344	1.308	1.275
320	0.60	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.373	1.333	1.292	1.257
360	0.67	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.327	1.288	1.248
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.36	1.462	1.462	1.462	1.462	1.462	1.462	1.444	1.408	1.371	1.338	1.311	1.284
240	0.43	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.421	1.383	1.345	1.313	1.283
280	0.51	1.438	1.438	1.438	1.438	1.438	1.438	1.438	1.433	1.397	1.358	1.318	1.286
320	0.58	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.382	1.344	1.305	1.265
360	0.65	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.332	1.295	1.258
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
200	0.33	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.399	1.367	1.334	1.306	1.282
240	0.40	1.400	1.400	1.400	1.400	1.400	1.400	1.400	1.394	1.361	1.328	1.295	1.269
280	0.46	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.365	1.330	1.295	1.263
320	0.53	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.323	1.288	1.253
360	0.59	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.270	1.237

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	18	16	14	12	10	5
ENGINE ONLY	-0.010	-0.013	-0.015	-0.015	-0.015	-0.010
ENGINE & WING*	-0.015	-0.018	-0.019	-0.019	-0.018	-0.012
ENGINE & WING**	-0.021	-0.024	-0.024	-0.023	-0.022	-0.014

*** Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	17500	16100	14600
280	271	273	19400	18000	16600
260	252	264	21300	20000	18600
240	232	253	23300	22100	20700
220	213	243	25400	24200	22900
200	194	231	27400	26200	25100
180	174	219	29500	28300	27200
160	154	206	32200	30600	29500

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
136	127	119	112	106	100	95	90	86	82	79
272	254	238	224	211	200	190	181	173	165	158
407	380	356	335	317	300	285	271	259	248	238
541	505	474	447	422	400	380	362	346	331	317
675	631	592	558	527	500	475	453	433	414	397
808	755	709	669	633	600	571	544	520	498	477
940	880	827	780	738	700	666	635	607	581	558
1072	1004	944	890	843	800	761	726	694	665	638
1204	1128	1061	1001	948	900	857	817	782	749	719
1335	1251	1177	1112	1053	1000	952	909	869	833	799
1467	1375	1294	1222	1158	1100	1048	1000	957	917	880
1598	1499	1411	1333	1263	1200	1143	1091	1044	1001	961
1729	1622	1527	1443	1368	1300	1239	1183	1132	1085	1042
1860	1746	1644	1554	1473	1400	1334	1274	1219	1169	1122
1992	1869	1761	1664	1578	1500	1429	1365	1306	1253	1203
2123	1993	1878	1775	1683	1600	1525	1456	1394	1336	1284
2255	2117	1995	1886	1788	1700	1620	1548	1481	1420	1364
2388	2241	2112	1997	1893	1800	1716	1639	1568	1504	1445

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	160	180	200	220	240	260	280	300	
100	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	0:16
200	2.5	2.6	2.8	2.9	3.1	3.2	3.3	3.4	0:32
300	3.8	4.1	4.4	4.7	5.0	5.2	5.5	5.7	0:47
400	5.1	5.6	6.0	6.5	6.9	7.4	7.8	8.2	1:03
500	6.4	7.0	7.6	8.2	8.9	9.4	10.0	10.6	1:18
600	7.7	8.4	9.1	9.9	10.7	11.4	12.1	12.9	1:33
700	8.9	9.8	10.6	11.5	12.5	13.3	14.2	15.1	1:47
800	10.1	11.1	12.1	13.1	14.2	15.2	16.3	17.3	2:02
900	11.3	12.5	13.6	14.7	16.0	17.2	18.3	19.5	2:16
1000	12.5	13.8	15.1	16.4	17.7	19.1	20.4	21.6	2:31
1100	13.6	15.1	16.5	18.0	19.5	20.9	22.4	23.8	2:45
1200	14.8	16.4	18.0	19.5	21.2	22.8	24.4	25.9	2:59
1300	16.0	17.7	19.4	21.1	22.9	24.7	26.4	28.1	3:14
1400	17.1	19.0	20.8	22.7	24.6	26.5	28.4	30.2	3:28
1500	18.3	20.3	22.3	24.2	26.3	28.3	30.3	32.3	3:42
1600	19.4	21.6	23.7	25.8	28.0	30.1	32.3	34.4	3:57
1700	20.6	22.8	25.1	27.3	29.7	32.0	34.2	36.5	4:11
1800	21.7	24.1	26.5	28.8	31.3	33.7	36.2	38.5	4:26

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	15000	12700	10300
290	15700	13600	11200
280	16300	14400	12000
270	17000	15300	13000
260	18100	16500	14600
250	19200	17600	15800
240	20300	18800	17000
230	21400	20000	18200
220	22500	21100	19400
210	23600	22300	20700
200	24800	23500	22000
190	26000	24800	23400
180	27300	26000	24800
170	28600	27300	26100
160	30000	28600	27400

320 KIAS Altitude Capability

Max Continuous Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	15300	13100	10800
290	16000	14000	11700
280	16700	14900	12500
270	17400	15600	13400
260	18100	16300	14300
250	18700	17000	15100
240	19400	17600	15700
230	20000	18200	16400
220	20500	18800	16900
210	20900	19400	17500
200	21400	20000	18100
190	21800	20400	18600
180	22200	20800	19000
170	22600	21200	19500
160	22900	21500	19900
150	23200	21800	20300
140	23500	22100	20600

With engine anti-ice on, decrease altitude capability by 300 ft.
With engine and wing anti-ice on, decrease altitude capability by 600 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
300	EPR	1.259	1.366						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	8919	9092						
280	EPR	1.236	1.333	1.383					
	MACH	.585	.641	.665					
	KIAS	325	325	325					
	FF/ENG	8548	8681	8780					
260	EPR	1.213	1.297	1.341	1.398				
	MACH	.577	.627	.651	.680				
	KIAS	321	318	318	320				
	FF/ENG	8069	8080	8152	8331				
240	EPR	1.188	1.260	1.298	1.344	1.402			
	MACH	.558	.606	.627	.652	.681			
	KIAS	310	307	306	306	308			
	FF/ENG	7412	7389	7412	7482	7658			
220	EPR	1.164	1.226	1.258	1.297	1.343	1.402		
	MACH	.538	.585	.605	.626	.651	.681		
	KIAS	298	296	294	294	294	296		
	FF/ENG	6764	6736	6728	6748	6810	6972		
200	EPR	1.141	1.195	1.223	1.254	1.293	1.339	1.398	
	MACH	.516	.562	.581	.601	.623	.648	.677	
	KIAS	286	284	283	282	281	281	282	
	FF/ENG	6126	6094	6085	6077	6089	6140	6273	
180	EPR	1.119	1.166	1.189	1.217	1.247	1.284	1.330	1.386
	MACH	.492	.537	.556	.576	.596	.617	.642	.671
	KIAS	272	271	270	269	268	267	267	268
	FF/ENG	5490	5462	5451	5443	5434	5438	5475	5573
160	EPR	1.098	1.139	1.158	1.181	1.207	1.237	1.272	1.316
	MACH	.466	.510	.529	.548	.568	.588	.609	.633
	KIAS	258	257	256	256	255	254	253	252
	FF/ENG	4862	4838	4827	4817	4809	4800	4796	4817

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
287	264	244	227	213	200	191	182	174	167	160
576	530	489	455	426	400	381	364	348	334	321
865	796	735	684	640	600	572	546	522	501	482
1156	1064	982	913	853	800	763	729	698	669	643
1448	1332	1229	1142	1067	1000	953	910	871	835	803
1742	1602	1477	1372	1281	1200	1144	1092	1045	1002	963
2036	1871	1725	1602	1495	1400	1335	1274	1219	1168	1122
2332	2141	1973	1831	1709	1600	1525	1456	1392	1334	1282
2629	2414	2223	2062	1924	1800	1715	1637	1565	1500	1441

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.4	0:40	3.0	0:38	2.6	0:37	2.4	0:36	2.1	0:34
400	7.1	1:17	6.5	1:13	6.0	1:10	5.5	1:07	5.2	1:03
600	10.9	1:54	10.0	1:48	9.3	1:43	8.7	1:38	8.2	1:33
800	14.5	2:31	13.5	2:24	12.6	2:17	11.8	2:10	11.2	2:02
1000	18.2	3:09	16.9	2:59	15.8	2:51	14.9	2:42	14.2	2:32
1200	21.8	3:47	20.3	3:35	19.1	3:25	17.9	3:14	17.1	3:02
1400	25.3	4:26	23.7	4:12	22.2	3:59	20.9	3:47	20.0	3:33
1600	28.8	5:05	27.0	4:48	25.4	4:33	23.9	4:19	22.9	4:03
1800	32.3	5:44	30.3	5:25	28.5	5:08	26.9	4:52	25.7	4:34

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	-0.1	-0.1	0.0	0.1	0.3	0.4	0.6	0.7
4	-0.4	-0.2	0.0	0.4	0.7	1.1	1.5	1.9
6	-0.6	-0.3	0.0	0.6	1.2	1.8	2.4	3.1
8	-0.9	-0.4	0.0	0.8	1.6	2.5	3.4	4.3
10	-1.1	-0.5	0.0	1.0	2.1	3.2	4.3	5.4
12	-1.3	-0.7	0.0	1.2	2.5	3.8	5.2	6.6
14	-1.6	-0.8	0.0	1.4	2.9	4.5	6.1	7.7
16	-1.8	-0.9	0.0	1.6	3.3	5.1	6.9	8.8
18	-2.0	-1.0	0.0	1.8	3.7	5.7	7.8	10.0
20	-2.3	-1.1	0.0	2.0	4.1	6.3	8.6	11.1
22	-2.5	-1.2	0.0	2.2	4.5	6.9	9.5	12.1
24	-2.8	-1.4	0.0	2.4	4.9	7.5	10.3	13.2
26	-3.0	-1.5	0.0	2.5	5.2	8.1	11.1	14.3
28	-3.2	-1.6	0.0	2.7	5.6	8.7	11.9	15.4
30	-3.5	-1.7	0.0	2.9	5.9	9.2	12.7	16.4
32	-3.7	-1.8	0.0	3.0	6.2	9.7	13.5	17.4
34	-3.9	-2.0	0.0	3.1	6.6	10.3	14.2	18.5

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
277	257	240	225	212	200	191	182	174	167	161
551	513	479	449	423	400	382	366	351	337	324
826	769	718	674	635	600	574	550	527	506	487
1100	1025	957	898	847	800	765	732	702	675	650
1375	1280	1196	1123	1058	1000	957	916	879	844	813
1650	1537	1435	1348	1270	1200	1148	1099	1054	1013	976
1924	1792	1674	1572	1482	1400	1339	1283	1230	1183	1139
2199	2049	1914	1797	1693	1600	1530	1466	1406	1351	1301
2474	2305	2153	2021	1905	1800	1722	1649	1582	1520	1464

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		18		22	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.5	0:37	3.1	0:36	2.7	0:34	2.5	0:33
400	7.5	1:09	6.8	1:06	6.3	1:03	5.9	1:01
600	11.5	1:42	10.6	1:37	9.9	1:33	9.4	1:28
800	15.4	2:15	14.3	2:08	13.4	2:02	12.8	1:55
1000	19.3	2:47	18.0	2:39	16.9	2:31	16.2	2:23
1200	23.2	3:20	21.7	3:10	20.4	3:00	19.6	2:50
1400	27.0	3:52	25.3	3:40	23.9	3:29	22.9	3:18
1600	30.9	4:25	29.0	4:11	27.4	3:58	26.3	3:45
1800	34.7	4:58	32.6	4:42	30.8	4:27	29.6	4:12

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3
4	-0.1	-0.1	0.0	0.1	0.3	0.4	0.7	1.0
6	-0.2	-0.1	0.0	0.2	0.4	0.8	1.1	1.6
8	-0.3	-0.2	0.0	0.3	0.6	1.0	1.6	2.2
10	-0.4	-0.2	0.0	0.4	0.8	1.3	2.0	2.8
12	-0.5	-0.3	0.0	0.4	1.0	1.6	2.4	3.4
14	-0.6	-0.3	0.0	0.5	1.2	1.9	2.8	4.0
16	-0.7	-0.4	0.0	0.6	1.3	2.2	3.3	4.6
18	-0.8	-0.4	0.0	0.7	1.5	2.5	3.6	5.1
20	-0.9	-0.5	0.0	0.7	1.7	2.7	4.0	5.6
22	-1.0	-0.5	0.0	0.8	1.8	3.0	4.4	6.1
24	-1.1	-0.6	0.0	0.9	2.0	3.2	4.8	6.6
26	-1.1	-0.6	0.0	0.9	2.1	3.5	5.1	7.1
28	-1.2	-0.7	0.0	1.0	2.3	3.7	5.5	7.6
30	-1.3	-0.7	0.0	1.1	2.4	4.0	5.8	8.1
32	-1.4	-0.8	0.0	1.1	2.6	4.2	6.2	8.5
34	-1.4	-0.8	0.0	1.2	2.7	4.4	6.5	9.0

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
300	EPR	1.163	1.2	1.271	1.363		
	KIAS	260	260	262	277		
	FF/ENG	8080	8090	8160	8510		
280	EPR	1.147	1.179	1.242	1.327	1.46	
	KIAS	251	251	253	261	286	
	FF/ENG	7480	7480	7530	7730	8420	
260	EPR	1.131	1.159	1.215	1.294	1.401	
	KIAS	242	242	243	246	266	
	FF/ENG	6890	6900	6910	7010	7430	
240	EPR	1.116	1.141	1.189	1.259	1.352	
	KIAS	232	233	234	235	247	
	FF/ENG	6310	6310	6320	6370	6620	
220	EPR	1.101	1.124	1.165	1.225	1.31	1.437
	KIAS	223	223	224	224	230	251
	FF/ENG	5760	5740	5740	5760	5880	6350
200	EPR	1.087	1.105	1.141	1.192	1.268	1.37
	KIAS	216	216	216	216	216	229
	FF/ENG	5240	5200	5190	5190	5240	5480
180	EPR	1.074	1.089	1.119	1.161	1.224	1.316
	KIAS	209	209	209	209	209	209
	FF/ENG	4850	4690	4660	4660	4680	4750
160	EPR	1.062	1.075	1.097	1.133	1.184	1.26
	KIAS	202	202	202	202	202	202
	FF/ENG	4350	4300	4150	4150	4140	4170
140	EPR	1.049	1.06	1.079	1.107	1.148	1.21
	KIAS	194	194	194	194	194	194
	FF/ENG	3860	3810	3660	3690	3680	3640

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	670	570				
50	720	620	480			
48	770	670	530			
46	830	720	580	430		
44	870	770	630	470		
42	910	830	680	500	370	
40	950	880	720	540	400	
38	990	920	760	570	430	280
36	1020	960	800	610	460	310
34	1060	1000	830	640	490	340
32	1060	1030	870	680	520	370
30	1070	1070	900	710	550	400
20	1090	1090	980	840	680	520
10	1110	1110	1000	850	700	570
0	1130	1140	1020	870	720	580
-20	1230	1240	1110	950	780	640
-40	1230	1240	1110	950	780	640

Rate of climb capability shown is valid for 180000 kg, gear down at VREF20 + 5.
Decrease rate of climb 50 ft/min per 5000 kg greater than 180000 kg.
Increase rate of climb 70 ft/min per 5000 kg less than 180000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	190	90				
50	240	130	-10			
48	280	180	40			
46	330	220	80	-70		
44	370	270	130	-40		
42	410	320	170	-10	-140	
40	440	370	210	30	-110	
38	470	400	240	60	-90	-230
36	510	430	280	90	-60	-200
34	540	470	310	120	-30	-180
32	540	500	340	150	0	-150
30	540	540	370	180	30	-130
20	550	550	430	280	130	-30
10	560	560	440	290	140	10
0	580	570	450	300	150	10
-20	600	600	470	310	160	20
-40	630	630	490	330	170	20

Rate of climb capability shown is valid for 180000 kg, gear down at VREF30 + 5.
Decrease rate of climb 50 ft/min per 5000 kg greater than 180000 kg.
Increase rate of climb 70 ft/min per 5000 kg less than 180000 kg.

ALTERNATE MODE EEC

Limit Weight

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 KG)									
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 KG)									
	140	160	180	200	220	240	260	280	300	320
FIELD	134.5	153.0	171.5	190.0	208.5	227.0	245.5	264.0	282.5	301.0
CLIMB	127.9	146.2	164.5	182.8	201.1	219.4	237.6	255.9	274.2	292.5
OBSTACLE	130.0	148.1	166.2	184.3	202.4	220.5	238.6	256.7	274.8	292.9
NET LEVEL OFF WEIGHT	130.0	148.4	166.9	185.3	203.8	222.2	240.7	259.1	277.5	296.0
LANDING CLIMB	127.2	145.6	164.1	182.5	200.9	219.4	237.8	256.2	274.6	293.1

Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
V1	+1
VR	0
V2	0

Max Takeoff %N1

Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	92.4	92.7	92.9	93.1	93.3	93.4	93.4	93.4	93.3	93.2	93.1
50	122	93.4	93.9	93.9	93.9	93.9	94.0	94.1	94.1	94.0	94.0	93.9
45	113	94.4	95.0	95.0	95.0	94.8	94.7	94.7	94.7	94.7	94.6	94.6
40	104	94.9	96.3	96.1	96.1	95.7	95.4	95.3	95.3	95.3	95.3	95.2
35	95	95.4	96.9	97.0	96.9	96.5	96.1	96.1	96.0	96.0	96.0	96.0
30	86	94.9	98.0	97.8	97.8	97.4	97.0	96.9	96.9	96.8	96.8	96.7
25	77	94.1	97.4	97.8	98.2	97.9	97.6	97.8	97.7	97.6	97.6	97.6
20	68	93.3	96.6	97.0	97.4	97.6	97.8	97.7	97.8	97.9	97.8	97.8
15	59	92.5	95.7	96.1	96.6	96.8	96.9	97.2	97.4	97.8	98.0	97.9
10	50	91.7	94.9	95.3	95.7	95.9	96.1	96.3	96.5	96.9	97.3	97.5
5	41	90.9	94.0	94.4	94.9	95.1	95.2	95.5	95.7	96.1	96.5	96.6
0	32	90.1	93.2	93.6	94.0	94.2	94.4	94.6	94.8	95.2	95.6	95.8
-10	14	88.4	91.5	91.9	92.3	92.5	92.6	92.9	93.1	93.5	93.8	94.0
-20	-4	86.7	89.7	90.1	90.5	90.7	90.9	91.1	91.3	91.7	92.0	92.2
-30	-22	85.0	87.9	88.3	88.7	88.9	89.0	89.3	89.5	89.8	90.2	90.3
-40	-40	83.2	86.1	86.5	86.9	87.0	87.2	87.4	87.6	88.0	88.3	88.5
-50	-58	81.4	84.2	84.6	85.0	85.1	85.3	85.5	85.7	86.1	86.4	86.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
PACKS OFF	0.1	0.2	0.2	0.2	0.2	0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3

ALTERNATE MODE EEC

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT) / SPEED (KIAS OR MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
	310	310	310	310	310	310	310	.84	.84	.84
60	83.9	84.6	86.7	89.4	92.2	93.4	94.5	96.1	96.3	96.0
50	85.4	86.2	86.7	88.1	90.8	92.0	93.1	94.7	94.9	94.5
40	86.8	87.5	88.0	88.9	89.8	90.6	91.6	93.2	93.4	93.1
30	85.9	88.8	89.4	90.2	91.0	90.8	90.5	91.7	91.9	91.6
20	84.5	87.3	89.8	91.3	92.1	91.8	91.9	90.9	90.3	90.0
15	83.7	86.6	89.1	91.7	92.6	92.5	92.3	91.5	91.1	90.9
10	83.0	85.8	88.3	90.9	93.2	93.1	92.9	92.1	91.7	91.5
5	82.3	85.1	87.5	90.1	92.8	93.9	93.6	92.5	92.2	92.1
0	81.5	84.3	86.7	89.3	92.0	93.9	94.5	93.3	92.8	92.7
-5	80.8	83.5	85.9	88.5	91.1	93.0	94.6	94.3	93.8	93.7
-10	80.0	82.7	85.1	87.7	90.3	92.1	93.7	95.4	94.9	94.8
-15	79.3	81.9	84.3	86.8	89.4	91.2	92.9	95.4	96.0	95.9
-20	78.5	81.1	83.5	86.0	88.5	90.4	91.9	94.5	95.0	94.9
-25	77.7	80.3	82.7	85.1	87.7	89.5	91.0	93.5	94.1	94.0
-30	76.9	79.5	81.8	84.3	86.8	88.5	90.1	92.6	93.1	93.0
-35	76.1	78.7	81.0	83.4	85.9	87.6	89.2	91.6	92.2	92.1
-40	75.3	77.9	80.1	82.5	85.0	86.7	88.2	90.7	91.2	91.1

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.4	-0.5	-0.7	-0.6	-0.3	-0.2	-0.1	-0.1	-0.1	-0.2
ENGINE & WING ANTI-ICE ON	-0.5	-0.6	-0.8	-0.8	-0.5	-0.5	-0.4	-0.5	-0.6	-0.7

Max Cruise %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	89.6	89.4	89.5	89.9	89.2	89.3	89.6	89.5	89.3	89.1
20	90.1	90.0	90.1	90.4	89.9	89.2	88.9	88.8	88.6	88.4
15	90.7	90.5	90.6	90.9	90.5	89.9	89.5	89.5	89.3	89.2
10	91.1	91.0	91.1	91.4	90.9	90.4	90.1	90.1	90.0	89.9
5	91.7	91.5	91.6	91.9	91.4	90.8	90.6	90.5	90.5	90.4
0	91.5	91.9	92.2	92.5	92.0	91.4	91.1	91.0	91.0	90.9
-5	90.7	91.1	91.8	92.6	92.7	92.1	91.8	91.7	91.7	91.6
-10	89.8	90.2	91.0	91.7	92.6	92.9	92.6	92.5	92.5	92.4
-15	89.0	89.4	90.1	90.8	91.7	92.7	93.2	93.1	93.1	93.0
-20	88.1	88.5	89.2	89.9	90.8	91.8	92.2	92.2	92.2	92.1
-25	87.2	87.6	88.3	89.0	89.9	90.9	91.3	91.3	91.3	91.2
-30	86.3	86.7	87.5	88.1	89.0	89.9	90.4	90.4	90.3	90.3
-35	85.4	85.8	86.5	87.2	88.1	89.0	89.5	89.4	89.4	89.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)				
	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING ANTI-ICE ON	-0.4	-0.4	-0.5	-0.5	-0.6

ALTERNATE MODE EEC

Go-Around %N1

Based on engine bleed for packs on, engine anti-ice on or off, wing anti-ice off

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	93.4	93.9	93.9	93.8	94.0	94.2	94.3	94.3	94.3	94.2	94.1	94.1
46	115	50	94.4	95.0	95.1	95.1	94.9	94.8	94.9	95.0	94.9	94.9	94.9	94.8
41	106	45	95.1	96.2	96.1	96.1	95.8	95.6	95.6	95.6	95.5	95.5	95.5	95.5
36	97	40	95.5	97.0	97.0	96.9	96.6	96.2	96.2	96.2	96.1	96.1	96.0	96.0
31	88	35	95.3	97.7	97.7	97.7	97.3	97.0	96.9	96.9	96.8	96.8	96.8	96.7
26	79	30	94.6	97.3	98.0	98.4	98.0	97.7	97.7	97.6	97.6	97.6	97.5	97.5
21	70	25	93.8	96.5	97.2	97.8	98.1	98.3	98.1	98.2	98.2	98.1	98.0	98.0
17	62	20	93.0	95.7	96.4	97.0	97.2	97.5	97.8	98.0	98.3	98.3	98.1	97.9
12	53	15	92.2	94.9	95.5	96.1	96.4	96.7	96.9	97.1	97.6	98.0	98.3	98.3
7	45	10	91.4	94.0	94.7	95.3	95.6	95.9	96.1	96.3	96.7	97.1	97.5	97.9
2	36	5	90.6	93.2	93.9	94.4	94.7	95.0	95.2	95.4	95.9	96.3	96.6	97.0
-3	27	0	89.8	92.4	93.0	93.6	93.9	94.1	94.4	94.6	95.0	95.4	95.8	96.1
-13	9	-10	88.1	90.7	91.3	91.9	92.1	92.4	92.6	92.8	93.3	93.6	94.0	94.3
-23	-9	-20	86.4	88.9	89.5	90.1	90.4	90.6	90.8	91.0	91.5	91.8	92.2	92.5
-33	-27	-30	84.7	87.1	87.8	88.3	88.6	88.8	89.0	89.2	89.6	90.0	90.3	90.7
-43	-45	-40	82.9	85.3	85.9	86.5	86.7	87.0	87.2	87.4	87.8	88.1	88.5	88.8
-53	-63	-50	81.1	83.5	84.1	84.6	84.8	85.1	85.3	85.5	85.9	86.2	86.5	86.9

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.1	0.1	0.2	0.2	0.2	0.2	0.2
1 PACK ON	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3

Intentionally
Blank

ALTERNATE MODE EEC
ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	92.7	92.4	92.1	91.6	90.9	90.5	90.5	90.2	90.0
15	93.2	92.9	92.5	92.1	91.5	91.2	91.1	91.0	90.9
10	93.7	93.5	93.1	92.5	92.1	91.8	91.7	91.6	91.5
5	94.1	94.1	93.7	93.2	92.5	92.3	92.2	92.1	92.1
0	93.2	94.4	94.6	94.0	93.3	92.9	92.9	92.8	92.8
-5	92.4	93.6	94.8	94.9	94.3	93.9	93.9	93.8	93.7
-10	91.5	92.7	93.9	95.1	95.4	95.0	95.0	94.9	94.8
-15	90.6	91.8	93.0	94.2	95.4	96.0	96.0	95.9	95.9
-20	89.7	90.9	92.1	93.3	94.5	95.1	95.1	95.0	94.9
-25	88.9	90.0	91.2	92.3	93.6	94.1	94.1	94.1	94.0
-30	88.0	89.1	90.3	91.4	92.6	93.2	93.2	93.1	93.0
-35	87.0	88.2	89.3	90.5	91.6	92.2	92.2	92.1	92.1
-40	86.1	87.2	88.4	89.5	90.7	91.3	91.2	91.2	91.1

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
ENGINE & WING*	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.6	-0.6	-0.7
ENGINE & WING**	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1	-1.2

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

320 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.6	94.2	94.1	93.7	93.4	92.7	92.1	91.6	91.2	91.1	90.9	91.0	91.0	90.5	90.8	91.9
25	92.9	95.0	95.0	94.6	94.3	93.5	92.9	92.2	91.7	91.6	91.6	91.7	91.7	91.3	91.5	92.3
20	92.1	94.6	95.6	95.6	95.3	94.5	93.8	93.0	92.3	92.1	92.0	92.2	92.2	91.8	92.0	92.7
15	91.3	93.8	94.8	95.5	96.3	95.6	94.9	93.8	93.0	92.7	92.6	92.7	92.7	92.3	92.5	93.2
10	90.5	93.0	94.0	94.7	95.5	95.7	96.0	94.8	93.7	93.3	93.2	93.3	93.2	92.9	93.0	93.8
5	89.7	92.2	93.1	93.9	94.6	94.9	95.1	94.8	94.5	94.1	94.0	94.0	93.8	93.5	93.7	94.6
0	88.9	91.3	92.3	93.0	93.8	94.0	94.3	93.9	93.6	93.5	94.1	94.8	94.6	94.3	94.5	95.4
-5	88.1	90.5	91.4	92.2	92.9	93.1	93.4	93.1	92.8	92.7	93.2	93.9	94.4	94.7	95.5	95.9
-10	87.2	89.6	90.6	91.3	92.0	92.3	92.5	92.2	91.9	91.8	92.3	93.0	93.5	93.8	94.6	95.0
-15	86.4	88.8	89.7	90.4	91.2	91.4	91.7	91.3	91.0	90.9	91.4	92.2	92.6	92.9	93.7	94.1
-20	85.6	87.9	88.8	89.6	90.3	90.5	90.8	90.4	90.1	90.0	90.6	91.3	91.7	92.0	92.8	93.2
-25	84.7	87.1	88.0	88.7	89.4	89.6	89.9	89.5	89.2	89.1	89.7	90.4	90.8	91.1	91.9	92.2
-30	83.9	86.2	87.1	87.8	88.5	88.7	89.0	88.6	88.3	88.2	88.7	89.4	89.9	90.2	91.0	91.3
-35	83.0	85.3	86.2	86.9	87.6	87.8	88.0	87.7	87.4	87.3	87.8	88.5	89.0	89.2	90.0	90.4
-40	82.1	84.4	85.3	85.9	86.6	86.8	87.1	86.8	86.5	86.4	86.9	87.6	88.0	88.3	89.1	89.4

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.6	-0.6	-0.6	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.8	-0.8	-0.8	-0.6	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.4
ENGINE & WING**	-0.6	-0.9	-1.0	-1.0	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

280 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.2	93.6	93.4	92.9	92.6	91.8	91.1	90.7	90.3	90.1	89.9	90.0	90.4	91.1	91.8	91.8
25	93.2	94.5	94.3	93.8	93.2	92.3	91.7	91.4	91.1	90.8	90.1	89.6	89.6	90.3	91.1	91.0
20	92.4	95.4	95.3	94.8	94.3	93.2	92.2	91.9	91.5	91.4	90.8	90.3	90.2	90.4	90.5	90.6
15	91.7	94.8	95.8	95.9	95.5	94.3	93.3	92.6	92.0	91.8	91.2	90.9	90.8	91.0	91.2	91.3
10	90.9	94.0	94.9	95.8	96.6	95.6	94.6	93.6	92.8	92.5	91.8	91.3	91.3	91.6	91.8	91.9
5	90.0	93.1	94.1	94.9	95.7	95.8	95.8	94.8	93.7	93.3	92.5	92.0	91.9	92.1	92.3	92.3
0	89.2	92.3	93.3	94.1	94.8	95.0	95.2	95.2	94.9	94.3	93.4	92.9	92.7	92.9	93.1	93.0
-5	88.4	91.4	92.4	93.2	94.0	94.1	94.3	94.4	94.4	94.3	94.4	93.9	93.7	93.9	94.1	94.0
-10	87.6	90.6	91.5	92.3	93.1	93.2	93.4	93.5	93.5	93.4	93.5	93.8	94.5	95.0	95.2	95.0
-15	86.8	89.7	90.7	91.5	92.2	92.3	92.5	92.6	92.6	92.5	92.6	92.9	93.6	94.7	95.8	95.5
-20	85.9	88.8	89.8	90.6	91.3	91.4	91.6	91.7	91.7	91.6	91.7	92.0	92.7	93.8	94.9	94.5
-25	85.1	88.0	88.9	89.7	90.4	90.5	90.7	90.8	90.8	90.7	90.8	91.1	91.8	92.8	93.9	93.6
-30	84.2	87.1	88.0	88.8	89.5	89.6	89.8	89.9	89.9	89.8	89.9	90.2	90.8	91.9	93.0	92.6
-35	83.3	86.2	87.1	87.8	88.6	88.7	88.8	88.9	88.9	88.9	89.0	89.3	89.9	91.0	92.0	91.7
-40	82.4	85.3	86.2	86.9	87.6	87.7	87.9	88.0	88.0	87.9	88.0	88.3	89.0	90.0	91.0	90.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	0.4	-0.7	-0.7	-0.7	-0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4	-0.4	-0.5	-0.5
ENGINE & WING**	-0.6	-1.0	-1.0	-1.1	-1.1	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.7	-0.9	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off
240 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	92.1	91.9	91.9	91.8	91.8	90.7	89.4	89.4	90.0	90.4	90.5	90.3	90.3	90.6	91.1	91.6
25	92.8	92.9	92.8	92.4	92.4	91.5	90.4	89.8	89.5	89.6	89.7	89.6	89.6	89.8	90.3	90.8
20	92.3	93.8	93.7	93.4	93.1	92.2	91.2	90.6	90.3	90.1	89.4	88.8	88.8	89.0	89.6	90.0
15	91.5	94.4	94.7	94.5	94.3	93.2	91.9	91.3	90.9	90.8	90.0	89.2	88.5	88.3	88.8	89.3
10	90.7	93.6	94.9	95.6	95.6	94.5	93.1	92.1	91.5	91.4	90.4	89.6	89.1	88.8	88.7	89.1
5	89.9	92.7	94.0	95.1	96.4	95.9	94.6	93.3	92.4	92.1	90.9	89.9	89.5	89.4	89.4	89.8
0	89.1	91.9	93.2	94.3	95.5	96.0	95.9	94.6	93.5	93.1	91.7	90.5	89.8	89.9	90.0	90.4
-5	88.3	91.1	92.3	93.4	94.6	95.1	95.2	95.1	94.7	94.3	92.7	91.4	90.6	90.6	90.6	91.1
-10	87.4	90.2	91.4	92.5	93.7	94.2	94.3	94.3	94.4	94.5	93.9	92.5	91.5	91.6	91.6	92.3
-15	86.6	89.4	90.6	91.7	92.8	93.3	93.4	93.4	93.5	93.6	93.3	93.0	92.8	92.8	92.8	93.4
-20	85.8	88.5	89.7	90.8	91.9	92.4	92.5	92.4	92.6	92.7	92.4	92.1	92.3	93.5	94.1	94.8
-25	84.9	87.6	88.8	89.9	91.0	91.5	91.6	91.5	91.6	91.8	91.4	91.2	91.4	92.5	93.7	94.6
-30	84.1	86.7	87.9	89.0	90.1	90.5	90.6	90.6	90.7	90.8	90.5	90.3	90.5	91.6	92.7	93.6
-35	83.2	85.8	87.0	88.0	89.2	89.6	89.7	89.7	89.8	89.9	89.6	89.4	89.5	90.6	91.7	92.7
-40	82.3	84.9	86.1	87.1	88.2	88.7	88.8	88.7	88.8	89.0	88.6	88.4	88.6	89.7	90.8	91.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6
ENGINE & WING**	-0.6	-1.0	-1.0	-1.2	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8	-0.9	-0.9	-0.9	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1
Based on engine bleed for packs on or off and anti-ice off
200 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	91.6	90.6	90.3	89.8	89.4	88.2	87.9	88.7	89.3	89.6	89.3	89.2	89.3	89.7	89.9	90.4
25	92.4	91.4	90.9	90.4	90.1	89.1	87.8	87.9	88.6	88.9	88.6	88.5	88.6	89.0	89.1	89.7
20	92.7	92.3	91.8	91.1	90.7	89.9	88.9	88.4	87.9	88.1	87.8	87.7	87.9	88.2	88.4	88.9
15	91.9	93.2	92.7	92.1	91.5	90.5	89.8	89.3	88.8	88.6	87.3	87.0	87.1	87.5	87.6	88.2
10	91.1	93.2	93.6	93.0	92.5	91.6	90.6	90.0	89.5	89.3	88.2	87.1	86.3	86.7	86.8	87.4
5	90.3	92.4	93.2	93.9	93.6	92.7	91.8	90.9	90.1	89.9	88.8	87.8	86.9	86.6	86.1	86.6
0	89.4	91.6	92.3	93.0	93.9	94.0	93.2	92.1	91.1	90.6	89.3	88.3	87.4	87.3	86.8	87.1
-5	88.6	90.7	91.5	92.2	93.1	93.6	94.3	93.5	92.3	91.7	90.2	88.9	87.8	87.8	87.5	87.8
-10	87.8	89.9	90.6	91.3	92.2	92.8	93.4	93.8	93.6	93.0	91.3	89.8	88.5	88.3	88.0	88.4
-15	87.0	89.0	89.7	90.4	91.3	91.9	92.5	92.9	93.2	93.3	92.6	90.8	89.4	89.2	88.9	89.3
-20	86.1	88.1	88.9	89.6	90.4	91.0	91.6	92.0	92.3	92.4	92.1	91.7	90.6	90.3	90.0	90.5
-25	85.3	87.3	88.0	88.7	89.5	90.1	90.7	91.1	91.4	91.5	91.1	90.8	90.5	91.6	91.3	91.8
-30	84.4	86.4	87.1	87.8	88.6	89.2	89.8	90.2	90.4	90.5	90.2	89.9	89.6	90.7	91.7	92.6
-35	83.5	85.5	86.2	86.9	87.7	88.3	88.8	89.2	89.5	89.6	89.3	89.0	88.7	89.7	90.7	91.6
-40	82.6	84.6	85.3	86.0	86.8	87.3	87.9	88.3	88.6	88.7	88.3	88.0	87.8	88.8	89.8	90.6

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.9	-0.7	-0.5	-0.6	-0.5	-0.5	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6
ENGINE & WING**	-0.6	-1.0	-1.1	-1.1	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.9	-0.9	-0.9	-1.0	-1.0	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

Driftdown Speed/Level Off Altitude - Alt Mode
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE FT		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	15900	14100	11900
280	271	272	17900	16300	14300
260	252	263	20000	18400	16500
240	232	253	22000	20600	18700
220	213	243	24100	22700	21000
200	194	232	26200	25000	23400
180	174	220	28300	27000	25700
160	154	208	30700	29200	27900

ALTERNATE MODE EEC
ENGINE INOP

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	12000	9000	5500
290	13000	10100	6700
280	13900	11100	7900
270	14900	12200	9000
260	16100	13700	10900
250	17300	15200	12600
240	18600	16500	14100
230	19900	17800	15600
220	21000	19200	16900
210	22200	20500	18200
200	23400	21800	19700
190	24700	23100	21200
180	25900	24500	22700
170	27200	25800	24300
160	28600	27100	25700

Performance Inflight — Chapter PI
Gear Down — Section 26

GEAR DOWN

220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	1.187	1.185	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
50	1.204	1.199	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
45	1.223	1.219	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
40	1.243	1.239	1.229	1.218	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
35	1.264	1.262	1.253	1.243	1.233.	1.223	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
30	1.280	1.286	1.276	1.268	1.259	1.250	1.243	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
25	1.280	1.311	1.303	1.293	1.284	1.276	1.271	1.267	1.259	1.262	1.260	1.251	1.246	1.235	1.225
20	1.280	1.323	1.331	1.321	1.312	1.304	1.299	1.296	1.290	1.280	1.260	1.251	1.246	1.235	1.225
15	1.280	1.323	1.360	1.350	1.342	1.334	1.329	1.326	1.321	1.313	1.293	1.264	1.246	1.235	1.225
10	1.280	1.323	1.366	1.377	1.373	1.366	1.362	1.359	1.352	1.345	1.325	1.295	1.270	1.246	1.225
5	1.280	1.323	1.366	1.377	1.391	1.399	1.396	1.394	1.389	1.380	1.359	1.326	1.298	1.276	1.256
0	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.431	1.426	1.419	1.397	1.359	1.325	1.306	1.292
-5	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.468	1.461	1.439	1.401	1.363	1.337	1.327
-10	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.484	1.444	1.406	1.381	1.369
-15	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.454	1.427	1.417
-20	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.480	1.480	1.469

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.008	-0.010	-0.015	-0.014	-0.006	-0.005	-0.003	-0.003
ENGINE AND WING*	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013
ENGINE AND WING**	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.023

***Wing anti-ice on, packs on.**
****Wing anti-ice on, single bleed source and both packs off.**

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13000	10400	7300
280	16200	13700	11000
260	19500	17200	14600
240	22500	20500	18200
220	25300	23600	21700
200	27300	26100	25000
180	29400	28200	27100
160	32100	30500	29300
140	35700	34000	32300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
300	EPR	1.240									
	MACH	.488									
	KIAS	270									
	FF/ENG	7412									
280	EPR	1.216	1.292	1.334							
	MACH	.474	.518	.538							
	KIAS	262	261	261							
	FF/ENG	6899	6901	6969							
260	EPR	1.192	1.261	1.295	1.338						
	MACH	.458	.501	.519	.540						
	KIAS	253	252	252	252						
	FF/ENG	6367	6344	6363	6431						
240	EPR	1.169	1.231	1.261	1.296	1.340	1.395				
	MACH	.441	.484	.501	.520	.541	.563				
	KIAS	244	243	243	242	242	242				
	FF/ENG	5839	5818	5811	5829	5893	5962				
220	EPR	1.147	1.202	1.229	1.259	1.295	1.339	1.394			
	MACH	.422	.465	.482	.500	.519	.541	.563			
	KIAS	233	234	233	233	232	232	232			
	FF/ENG	5304	5300	5291	5283	5299	5356	5419			
200	EPR	1.127	1.174	1.197	1.224	1.255	1.290	1.334	1.389		
	MACH	.402	.445	.462	.480	.498	.517	.538	.561		
	KIAS	222	223	223	223	222	222	222	222		
	FF/ENG	4772	4784	4779	4771	4763	4773	4820	4879		
180	EPR	1.110	1.147	1.167	1.190	1.218	1.247	1.281	1.324	1.378	
	MACH	.387	.422	.439	.457	.475	.493	.512	.534	.557	
	KIAS	213	212	212	212	212	211	211	211	211	
	FF/ENG	4327	4262	4268	4264	4257	4249	4252	4286	4341	
160	EPR	1.094	1.125	1.141	1.160	1.185	1.211	1.240	1.275	1.317	1.369
	MACH	.372	.403	.419	.436	.454	.472	.492	.513	.535	.558
	KIAS	205	202	202	202	202	202	202	202	202	202
	FF/ENG	3925	3818	3812	3805	3799	3797	3802	3815	3845	3887
140	EPR	1.079	1.106	1.120	1.136	1.157	1.180	1.205	1.233	1.267	1.308
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515	.537
	KIAS	194	194	194	194	194	194	194	194	194	194
	FF/ENG	3474	3496	3491	3486	3475	3468	3407	3409	3419	3444

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
324	290	260	236	217	200	189	179	170	161	154
656	584	523	474	435	400	378	357	339	323	308
991	882	788	714	653	600	567	536	509	484	462
1329	1181	1053	953	871	800	755	714	677	644	615
1670	1482	1320	1193	1090	1000	943	892	845	804	767
2014	1785	1589	1434	1309	1200	1132	1070	1014	964	919
2362	2091	1859	1676	1528	1400	1320	1248	1182	1123	1071
2715	2400	2130	1919	1748	1600	1508	1425	1349	1282	1223
3073	2711	2403	2163	1968	1800	1696	1602	1517	1441	1373
3434	3026	2678	2407	2189	2000	1884	1779	1684	1599	1524
3799	3343	2954	2652	2410	2200	2072	1955	1850	1756	1674
4169	3662	3232	2898	2631	2400	2259	2132	2016	1914	1824
4542	3984	3511	3145	2853	2600	2447	2308	2183	2071	1974
4921	4309	3792	3393	3075	2800	2635	2485	2349	2229	2123
5303	4637	4074	3641	3297	3000	2822	2661	2515	2386	2272
5689	4968	4358	3890	3519	3200	3010	2837	2681	2542	2421
6081	5301	4643	4140	3742	3400	3197	3012	2846	2698	2569
6477	5638	4930	4391	3966	3600	3384	3188	3011	2854	2717
6877	5977	5220	4643	4190	3800	3571	3363	3176	3010	2865
7283	6320	5510	4896	4414	4000	3758	3538	3340	3165	3012

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	6.7	0:49	6.1	0:47	5.3	0:44	4.8	0:42	4.4	0:40
400	13.9	1:37	12.9	1:31	11.5	1:24	10.7	1:20	10.1	1:16
600	21.0	2:25	19.5	2:17	17.5	2:06	16.4	1:59	15.6	1:53
800	27.9	3:15	26.0	3:04	23.4	2:48	22.0	2:39	20.9	2:30
1000	34.7	4:04	32.4	3:51	29.3	3:30	27.5	3:19	26.2	3:07
1200	41.3	4:55	38.6	4:40	35.0	4:14	32.9	3:59	31.3	3:45
1400	47.8	5:46	44.7	5:28	40.6	4:58	38.2	4:40	36.3	4:23
1600	54.2	6:38	50.8	6:17	46.2	5:42	43.4	5:22	41.3	5:02
1800	60.5	7:31	56.7	7:07	51.7	6:27	48.5	6:03	46.1	5:41
2000	66.7	8:24	62.6	7:57	57.2	7:12	53.6	6:45	51.0	6:20
2200	72.9	9:19	68.3	8:48	62.4	7:58	58.5	7:28	55.6	7:00
2400	79.0	10:14	74.0	9:39	67.7	8:44	63.4	8:11	60.2	7:39
2600	85.1	11:10	79.5	10:31	72.8	9:31	68.2	8:54	64.8	8:20
2800	91.0	12:07	85.0	11:24	77.8	10:18	73.0	9:38	69.2	9:01
3000	96.9	13:04	90.4	12:17	82.8	11:06	77.7	10:22	73.6	9:41
3200	102.5	14:03	95.7	13:12	87.6	11:54	82.3	11:07	77.9	10:23
3400	108.1	15:02	101.0	14:06	92.4	12:43	86.8	11:53	82.2	11:05
3600	113.6	16:02	106.2	15:02	97.1	13:33	91.3	12:38	86.4	11:47
3800	119.0	17:04	111.3	15:58	101.7	14:23	95.6	13:24	90.5	12:30
4000	124.4	18:05	116.4	16:54	106.3	15:13	100.0	14:11	94.7	13:13

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.4	-0.7	0.0	0.8	2.0	3.5	5.4	7.6
20	-2.1	-1.1	0.0	1.6	3.7	6.3	9.4	13.1
30	-2.9	-1.5	0.0	2.3	5.3	8.9	13.2	18.1
40	-3.7	-1.9	0.0	3.0	6.8	11.4	16.6	22.7
50	-4.6	-2.4	0.0	3.7	8.2	13.6	19.8	26.8
60	-5.4	-2.8	0.0	4.3	9.5	15.6	22.6	30.5
70	-6.3	-3.3	0.0	4.9	10.7	17.5	25.1	33.7
80	-7.2	-3.7	0.0	5.5	11.8	19.1	27.4	36.5
90	-8.1	-4.2	0.0	6.0	12.8	20.6	29.3	38.8
100	-9.1	-4.7	0.0	6.4	13.7	21.9	30.9	40.7
110	-10.1	-5.1	0.0	6.9	14.5	22.9	32.1	42.1
120	-11.1	-5.6	0.0	7.3	15.2	23.8	33.1	43.1
130	-12.1	-6.1	0.0	7.6	15.8	24.5	33.8	43.6

Descent at VREF30+80

PRESSURE ALT (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	41	45	49	53	57	61	65	69	73	78
TIME (MINUTES)	12	12	13	14	15	16	16	17	18	18

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
300	EPR	1.137	1.167	1.227	1.312				
	KIAS	248	248	248	248				
	FF/ENG	7150	7150	7170	7260				
280	EPR	1.123	1.15	1.202	1.278				
	KIAS	242	242	242	242				
	FF/ENG	6660	6660	6660	6710				
260	EPR	1.11	1.134	1.179	1.247	1.345			
	KIAS	236	236	236	236	236			
	FF/ENG	6190	6180	6170	6200	6330			
240	EPR	1.097	1.119	1.159	1.218	1.302			
	KIAS	229	229	229	229	229			
	FF/ENG	5750	5730	5720	5720	5780			
220	EPR	1.087	1.105	1.14	1.191	1.264	1.377		
	KIAS	223	223	223	223	223	223		
	FF/ENG	5330	5290	5280	5260	5280	5420		
200	EPR	1.077	1.092	1.123	1.167	1.231	1.324		
	KIAS	216	216	216	216	216	216		
	FF/ENG	5040	4880	4850	4830	4830	4900		
180	EPR	1.067	1.081	1.107	1.145	1.2	1.279	1.406	
	KIAS	209	209	209	209	209	209	209	
	FF/ENG	4640	4480	4430	4420	4400	4430	4560	
160	EPR	1.058	1.07	1.092	1.125	1.171	1.24	1.342	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	4240	4190	4030	4010	3990	3990	4060	
140	EPR	1.049	1.06	1.079	1.106	1.145	1.205	1.286	1.427
	KIAS	194	194	194	194	194	194	194	194
	FF/ENG	3840	3800	3640	3670	3660	3580	3600	3720

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.140	1.169	1.226	1.308	
	KIAS	228	228	228	228	
	FF/ENG	6830	6830	6830	6890	
280	EPR	1.126	1.153	1.203	1.277	1.386
	KIAS	222	222	222	222	222
	FF/ENG	6370	6360	6350	6380	6530
260	EPR	1.113	1.137	1.181	1.247	1.343
	KIAS	216	216	216	216	216
	FF/ENG	5920	5900	5890	5900	5990
240	EPR	1.101	1.122	1.162	1.219	1.302
	KIAS	209	209	209	209	209
	FF/ENG	5490	5460	5450	5440	5480
220	EPR	1.090	1.108	1.143	1.192	1.265
	KIAS	203	203	203	203	203
	FF/ENG	5060	5020	5000	4990	5010
200	EPR	1.080	1.095	1.125	1.167	1.230
	KIAS	196	196	196	196	196
	FF/ENG	4760	4600	4570	4560	4560
180	EPR	1.069	1.083	1.108	1.145	1.198
	KIAS	189	189	189	189	189
	FF/ENG	4340	4300	4140	4130	4120
160	EPR	1.059	1.072	1.092	1.124	1.167
	KIAS	182	182	182	182	182
	FF/ENG	3930	3890	3740	3770	3760
140	EPR	1.049	1.060	1.079	1.103	1.140
	KIAS	174	174	174	174	174
	FF/ENG	3590	3550	3500	3360	3350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	246	233	2200		
240	228	227	5600	3300	400
220	210	221	8500	6600	4200
200	191	214	11300	9700	7500
180	172	208	14100	12500	10700
160	153	200	16800	15400	13700
140	134	192	19500	18100	16500

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
240	3500		
220	6900	4800	1700
200	10100	8100	5800
180	13000	11300	9300
160	15900	14400	12500
140	18700	17200	15700

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)						
		5	7	9	11	13	15	17
240	EPR	1.394						
	MACH	.379						
	KIAS	229						
	FF/ENG	10859						
230	EPR	1.372	1.420					
	MACH	.374	.388					
	KIAS	226	226					
	FF/ENG	10399	10514					
220	EPR	1.350	1.395					
	MACH	.369	.382					
	KIAS	223	223					
	FF/ENG	9949	10039					
210	EPR	1.330	1.371	1.420				
	MACH	.363	.377	.391				
	KIAS	220	220	220				
	FF/ENG	9514	9582	9688				
200	EPR	1.310	1.348	1.393	1.447			
	MACH	.358	.371	.385	.400			
	KIAS	216	216	216	216			
	FF/ENG	9096	9139	9222	9351			
190	EPR	1.291	1.326	1.367	1.417	1.478		
	MACH	.352	.365	.379	.393	.408		
	KIAS	213	213	213	213	213		
	FF/ENG	8689	8712	8774	8870	9037		
180	EPR	1.273	1.305	1.343	1.388	1.442		
	MACH	.346	.359	.373	.387	.402		
	KIAS	209	209	209	209	209		
	FF/ENG	8291	8303	8340	8414	8529		
170	EPR	1.255	1.285	1.320	1.361	1.409	1.470	
	MACH	.340	.353	.366	.380	.395	.410	
	KIAS	206	206	206	206	206	206	
	FF/ENG	7892	7901	7919	7971	8055	8200	
160	EPR	1.238	1.266	1.298	1.335	1.379	1.432	1.500
	MACH	.334	.346	.359	.373	.388	.403	.419
	KIAS	202	202	202	202	202	202	202
	FF/ENG	7496	7504	7513	7541	7605	7701	7882
150	EPR	1.221	1.247	1.276	1.310	1.350	1.397	1.456
	MACH	.327	.340	.353	.366	.380	.395	.411
	KIAS	198	198	198	198	198	198	198
	FF/ENG	7109	7109	7116	7129	7168	7238	7355
140	EPR	1.205	1.228	1.256	1.287	1.323	1.365	1.416
	MACH	.321	.333	.345	.359	.373	.387	.403
	KIAS	194	194	194	194	194	194	194
	FF/ENG	6729	6721	6725	6732	6750	6799	6877

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
170	150	132	119	109	100	93	88	83	78	75
349	305	269	241	219	200	187	175	164	154	146
529	462	406	363	329	300	279	260	244	230	218
710	620	544	486	440	400	372	347	325	306	290
892	778	681	608	550	500	465	433	406	381	361
1075	936	819	730	660	600	558	520	487	458	433
1259	1096	958	853	771	700	651	606	567	533	504
1444	1256	1097	976	882	800	743	692	647	608	575
1630	1416	1236	1100	992	900	836	778	727	683	646
1817	1577	1375	1223	1103	1000	928	864	808	759	717

Reference Fuel and Time Required at Check Point

AIR DIST(NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	3.3	0:28	3.1	0:27	2.9	0:27	2.7	0:26	2.6	0:26
200	6.9	0:54	6.6	0:53	6.4	0:52	6.1	0:50	5.9	0:49
300	10.5	1:21	10.1	1:19	9.8	1:17	9.5	1:15	9.2	1:13
400	14.1	1:48	13.6	1:45	13.2	1:42	12.8	1:39	12.5	1:36
500	17.6	2:15	17.0	2:11	16.5	2:07	16.1	2:04	15.7	2:00
600	21.1	2:42	20.4	2:37	19.8	2:33	19.3	2:29	18.9	2:24
700	24.6	3:09	23.8	3:04	23.1	2:59	22.5	2:54	22.0	2:49
800	28.0	3:37	27.1	3:31	26.3	3:25	25.6	3:19	25.1	3:13
900	31.3	4:05	30.4	3:58	29.5	3:51	28.8	3:44	28.1	3:37
1000	34.7	4:33	33.6	4:25	32.7	4:17	31.8	4:09	31.2	4:02

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
4	-0.4	-0.2	0.0	0.3	0.8	1.3
6	-0.7	-0.3	0.0	0.5	1.2	2.0
8	-0.9	-0.5	0.0	0.7	1.6	2.7
10	-1.2	-0.6	0.0	0.9	2.0	3.3
12	-1.4	-0.7	0.0	1.0	2.4	4.0
14	-1.7	-0.8	0.0	1.2	2.7	4.6
16	-1.9	-1.0	0.0	1.4	3.1	5.2
18	-2.1	-1.1	0.0	1.5	3.5	5.8
20	-2.4	-1.2	0.0	1.7	3.8	6.4
22	-2.6	-1.3	0.0	1.8	4.1	7.0
24	-2.9	-1.4	0.0	2.0	4.5	7.5
26	-3.1	-1.6	0.0	2.1	4.8	8.0
28	-3.3	-1.7	0.0	2.3	5.1	8.5
30	-3.6	-1.8	0.0	2.4	5.4	9.0
32	-3.8	-1.9	0.0	2.6	5.7	9.5
34	-4.1	-2.0	0.0	2.7	6.0	10.0
36	-4.3	-2.2	0.0	2.8	6.2	10.4

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
240	EPR	1.322	1.394		
	KIAS	229	229		
	FF/ENG	11260	11400		
220	EPR	1.288	1.350		
	KIAS	223	223		
	FF/ENG	10380	10450		
200	EPR	1.256	1.310	1.419	
	KIAS	216	216	216	
	FF/ENG	9530	9550	9740	
180	EPR	1.226	1.273	1.365	
	KIAS	209	209	209	
	FF/ENG	8700	8710	8790	
160	EPR	1.197	1.238	1.316	1.432
	KIAS	202	202	202	202
	FF/ENG	7880	7870	7900	8090
140	EPR	1.171	1.205	1.271	1.365
	KIAS	194	194	194	194
	FF/ENG	7090	7070	7060	7140

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight — Chapter PI
Text — Section 28

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

FMC Takeoff Speeds

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

Dry Snow

Enter the table with the dry snow depth and read the Equivalent Slush/ Standing Water Depth used to enter the Slush/Standing Water table.

Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

(1) Determine the dry field/obstacle limit weight for the takeoff flap setting.

(2) Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.

(3) Adjust field length available for temperature by amount shown on chart.

(4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

(1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.

(2) If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

Slippery Runway

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will

appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

If takeoffs are scheduled using these simplified speeds in conjunction with airport analyses that include clearway and/or stopway credits, adjustments to V1 speed are required.

Adjust V1 by the amount shown in the Clearway/Stopway table. The adjusted V1 must not exceed VR.

The maximum allowable clearway limits shown on the takeoff speeds page are provided for guidance when more precise data is unavailable.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around EPR

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

Max Climb EPR

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average EPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target EPR, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target EPR, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 is based on

VREF30+60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC/320 KIAS speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target EPR, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative for Long Range Cruise and 320 KIAS. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit and the more limiting of the two must be used as the landing limit weight. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

Max Cruise %N1

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Alternate Mode EEC, Engine Inoperative

Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

Driftdown/LRC Cruise Range Capability

Engine inoperative range capability is provided to determine the fuel and time required for a specified distance when the recommended driftdown procedure is followed.

Long Range Cruise Altitude Capability

Altitude capability is provided in the same format as the gear up data shown in Chapter 3 for Max Climb Thrust and Long Range Cruise speed with 100 ft/min residual rate of climb.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

777-300 TRENT892 KG FAA

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Performance Inflight — Chapter PI
General — Section 30

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	150
2000	180
2500	210
3000	230
3500	260
4000	280
4500	310

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS) DRY RUNWAY			
	100	120	140	160
200	-3	-3	-2	-2
100	-2	-1	-1	-1
0	0	0	0	0
-100	4	3	3	2
-200	6	6	5	3
-300	6	8	7	5

Use of clearway not allowed on wet runway.

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
300	169	174	183
290	165	172	181
280	162	169	177
270	159	166	174
260	156	163	171
250	153	160	168
240	150	157	165
230	147	153	161
220	144	150	158
210	140	146	154
200	137	143	150
190	133	139	146
180	129	135	142
170	125	131	138
160	121	127	134

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30+80
FLAPS 1	VREF30+60
FLAPS 5	VREF30+40
FLAPS 15	VREF30+20
FLAPS 20	VREF30+20
FLAPS 25	VREF25
FLAPS 30	VREF30

Dry Snow Conversion Table

Dry Snow Depth (mm)	Equivalent Slush/Standing Water Depth (mm)
20	2.50
40	5.00
60	7.50
80	10.00
100	12.50

For dry snow, enter the Slush/Standing Water table with the equivalent depth shown in the table above.

ADVISORY INFORMATION

Slush/Standing Water Takeoff

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-32.8	-37.4	-41.9	-37.8	-42.4	-46.9	-49.1	-53.6	-58.2
300	-31.6	-36.1	-40.6	-36.4	-40.9	-45.4	-46.8	-51.4	-55.9
280	-29.8	-34.4	-38.9	-34.3	-38.8	-43.4	-43.8	-48.3	-52.9
260	-27.6	-32.1	-36.7	-31.6	-36.1	-40.7	-40.0	-44.6	-49.1
240	-24.8	-29.4	-33.9	-28.3	-32.8	-37.4	-35.5	-40.0	-44.6
220	-21.6	-26.2	-30.7	-24.4	-28.9	-33.4	-30.2	-34.8	-39.3
200	-17.9	-22.5	-27.0	-19.8	-24.4	-28.9	-24.2	-28.8	-33.3
180	-13.8	-18.3	-22.8	-14.7	-19.2	-23.8	-17.5	-22.0	-26.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1700							157.0		
1800	141.4			157.7			185.2	147.6	
1900	171.5			187.3	147.7		215.5	175.4	
2000	202.6	161.2		218.8	177.1		248.7	204.9	165.9
2100	235.5	191.8	151.0	252.4	207.9	167.0	285.7	237.1	194.6
2200	270.4	224.1	181.3	288.7	240.7	197.2	328.0	272.6	225.8
2300	307.8	258.3	212.9	328.2	276.0	229.2		313.1	260.1
2400	347.1	294.8	246.4		314.5	263.7		357.0	298.6
2500		333.7	282.1		354.9	300.9			342.1
2600			320.3			341.2			
2700			359.7						

1. **Enter Weight Adjustment table with slush/standing water depth and field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -40 m/+40 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-19	-15	-11	-15	-11	-7	-6	-2	2
280	-21	-17	-13	-16	-12	-8	-7	-3	1
260	-23	-19	-15	-18	-14	-10	-8	-4	0
240	-25	-21	-17	-20	-16	-12	-10	-6	-2
220	-26	-22	-18	-22	-18	-14	-13	-9	-5
200	-27	-23	-19	-24	-20	-16	-16	-12	-8
180	-27	-23	-19	-25	-21	-17	-18	-14	-10
160	-28	-24	-20	-25	-21	-17	-20	-16	-12

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-2.0	-4.0	-14.5	-16.5	-18.5	-30.5	-32.5	-34.5
300	0.0	-2.0	-4.0	-16.3	-18.3	-20.3	-31.1	-33.1	-35.1
280	-1.0	-3.0	-5.0	-17.3	-19.3	-21.3	-30.9	-32.9	-34.9
260	-2.6	-4.6	-6.6	-17.6	-19.6	-21.6	-29.9	-31.9	-33.9
240	-3.6	-5.6	-7.6	-17.2	-19.2	-21.2	-28.1	-30.1	-32.1
220	-3.9	-5.9	-7.9	-16.0	-18.0	-20.0	-25.4	-27.4	-29.4
200	-3.7	-5.7	-7.7	-14.1	-16.1	-18.1	-21.9	-23.9	-25.9
180	-2.9	-4.9	-6.9	-11.5	-13.5	-15.5	-17.6	-19.6	-21.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1300	161.5								
1400	225.5	180.3							
1500	283.0	242.2	198.3						
1600	335.8	298.1	258.4						
1700		350.4	312.9	144.5					
1800				186.3	141.2				
1900				229.1	182.9				
2000				273.4	225.7	179.5			
2100				319.2	269.8	222.2			
2200					315.5	266.2			
2300						311.8	157.4		
2400						358.2	180.8		
2500							205.4	162.0	
2600							231.4	185.6	143.6
2700							259.1	210.5	166.6
2800							288.9	236.8	190.5
2900							321.2	264.9	215.6
3000							354.4	295.1	242.3
3100								327.8	270.7
3200									301.4
3300									334.5

1. **Enter Weight Adjustment table with reported braking action and field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -20m/+20m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30m/+30m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40m/+40m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-4	-2	0	-14	-12	-10	-27	-25	-23
280	-5	-3	-1	-16	-14	-12	-30	-28	-26
260	-7	-5	-3	-19	-17	-15	-34	-32	-30
240	-9	-7	-5	-21	-19	-17	-37	-35	-33
220	-10	-8	-6	-24	-22	-20	-40	-38	-36
200	-12	-10	-8	-26	-24	-22	-42	-40	-38
180	-13	-11	-9	-27	-25	-23	-44	-42	-40
160	-13	-11	-9	-28	-26	-24	-45	-43	-41

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Takeoff Speeds

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
320	184	193	198	174	183	187			
310	180	190	195	170	179	184			
300	177	187	192	167	176	182	162	168	174
290	173	183	189	163	173	179	159	165	172
280	170	180	187	160	169	176	156	162	169
270	166	176	184	157	166	173	152	159	166
260	162	173	181	153	163	171	149	156	164
250	159	169	178	149	159	168	145	152	161
240	155	165	174	146	156	165	141	149	158
230	150	161	171	142	152	162	137	145	155
220	146	157	168	137	148	158	134	141	152
210	142	153	164	133	144	155	129	137	149
200	137	148	161	129	140	152	124	133	145
190	132	144	157	123	136	148	119	129	142
180	127	139	153	119	131	145	115	125	138
170	121	135	149	114	127	141	109	121	135
160	115	130	145	108	122	137	104	117	131

Check V1(MCG) and Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	8	10	12	14			4	4	5	6			-2	-2	-3	-3		
50	122	5	6	9	11	14	16	2	3	4	5	6	7	-1	-1	-2	-2	-3	-3
40	104	1	3	5	9	11	13	1	1	3	4	5	6	0	-1	-1	-2	-2	-3
30	86	0	0	3	6	9	11	0	0	1	3	4	5	0	0	-1	-1	-2	-2
20	68	0	0	2	4	7	10	0	0	1	2	3	5	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	7	9	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
320	-6	-3	0	3	5	-4	-2	-1	0	0	1	1	2
280	-4	-2	0	3	4	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	4	-1	-1	0	0	1	2	2	2
200	-2	-1	0	2	4	-1	-1	0	0	1	2	2	3
160	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3

Clearway and Stopway V1 Adjustments*

NORMAL V1 (KIAS)	CLEARWAY MINUS STOPWAY (M)					
	200	100	0	-100	-200	-300
180	-2	-1	0	1	1	2
160	-2	-1	0	2	3	5
140	-2	-1	0	3	5	7
120	-3	-1	0	3	6	8
100	-3	-2	0	4	6	6

***V1 not to exceed VR.**

Max Allowable Clearway for V1 Adjustment

FIELD LENGTH (M)	1500	2000	2500	3000	3500	4000	4500
MAX ALLOWABLE CLEARWAY (M)	80	90	110	120	130	150	160

ADVISORY INFORMATION

TO1 Slush/Standing Water Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-23.9	-27.3	-30.7	-28.0	-31.4	-34.8	-37.6	-41.0	-44.4
300	-23.2	-26.6	-30.2	-27.1	-30.6	-34.2	-36.4	-40.0	-43.6
280	-23.2	-26.9	-30.7	-27.2	-31.0	-34.8	-36.2	-40.0	-43.8
260	-23.5	-27.5	-31.5	-27.5	-31.5	-35.5	-35.9	-39.9	-43.9
240	-23.0	-27.1	-31.4	-26.5	-30.8	-35.0	-34.2	-38.5	-42.7
220	-21.6	-25.8	-30.2	-24.5	-28.9	-33.3	-31.0	-35.4	-39.7
200	-18.9	-23.3	-27.7	-21.2	-25.5	-29.9	-26.2	-30.5	-34.9
180	-15.2	-19.5	-23.9	-16.5	-20.9	-25.3	-19.9	-24.3	-28.7

V1(MCG) Limit Weight (1000 KG)

ADUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600							159.1		
1800	181.4			197.3	152.1		225.9	179.6	
2000	251.7	203.2	157.2	269.1	219.4	173.0	305.0	249.4	200.8
2200	328.9	275.6	225.8	350.0	294.1	242.4		334.3	274.5
2400		354.6	300.2			320.3			

1. **Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -40 m/+40 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-16	-12	-7	-11	-7	-3	-2	3	7
280	-18	-14	-10	-13	-9	-5	-3	1	6
260	-20	-16	-12	-15	-11	-7	-5	-1	4
240	-22	-18	-14	-17	-13	-9	-7	-3	1
220	-24	-19	-15	-20	-16	-11	-10	-6	-2
200	-25	-20	-16	-21	-17	-13	-13	-9	-5
180	-25	-21	-17	-22	-18	-14	-16	-11	-7
160	-25	-21	-17	-23	-19	-14	-18	-14	-9

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff
8% Thrust Reduction
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.5	-3.3	-11.4	-13.2	-15.0	-27.0	-28.9	-30.7
300	0.0	-1.5	-3.3	-13.4	-15.3	-17.1	-28.0	-29.9	-31.7
280	0.0	-1.6	-3.4	-15.2	-17.1	-18.9	-28.7	-30.6	-32.5
260	-1.3	-3.2	-5.1	-16.2	-18.1	-19.9	-28.6	-30.4	-32.3
240	-2.7	-4.6	-6.5	-16.4	-18.3	-20.2	-27.5	-29.4	-31.3
220	-3.5	-5.4	-7.3	-15.8	-17.7	-19.6	-25.5	-27.4	-29.3
200	-3.6	-5.5	-7.4	-14.4	-16.3	-18.2	-22.6	-24.5	-26.4
180	-3.1	-5.0	-7.0	-12.1	-14.1	-16.0	-18.8	-20.7	-22.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	269.3	224.7	176.2						
1600		340.6	300.6						
1800				227.6	178.3				
2000				322.4	269.6	218.8			
2200						313.0	161.3		
2400							212.4	165.5	
2600							270.0	217.0	169.7
2800							336.9	275.3	221.7
3000								342.9	280.8
3200									348.9

1. **Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -21m/+21m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30m/+30m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45m/+45m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-3	-1	0	-12	-10	-9	-24	-22	-20
280	-5	-3	-2	-15	-13	-11	-27	-26	-24
260	-7	-5	-4	-17	-16	-14	-31	-29	-27
240	-8	-7	-5	-20	-18	-16	-34	-32	-30
220	-10	-8	-6	-22	-20	-18	-37	-35	-33
200	-11	-9	-7	-23	-22	-20	-39	-37	-35
180	-12	-10	-8	-25	-23	-21	-41	-39	-37
160	-12	-11	-9	-25	-23	-22	-42	-40	-38

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 Takeoff Speeds

8% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
300	180	188	192	170	177	181			
290	177	184	189	167	174	178	162	166	171
280	173	181	186	164	171	176	159	163	168
270	170	178	183	160	167	173	156	160	166
260	166	174	180	157	164	170	152	157	163
250	162	170	177	153	160	167	149	153	160
240	158	166	174	149	157	164	145	150	157
230	154	162	171	145	153	161	141	146	154
220	150	158	167	141	149	158	137	143	151
210	145	154	164	137	145	155	133	139	148
200	141	150	160	132	141	151	128	135	145
190	136	146	156	127	137	148	123	131	141
180	131	141	152	122	133	144	118	127	138
170	125	136	148	118	128	140	114	122	134
160	119	131	144	112	124	136	108	118	130

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	9	11	13			3	4	5	6			-2	-2	-2	-3		
50	122	4	5	8	10	12	14	2	3	4	5	6	7	-1	-1	-2	-2	-2	-3
40	104	1	3	5	7	10	12	1	1	2	4	5	6	0	-1	-1	-2	-2	-2
30	86	0	0	3	5	8	10	0	0	1	3	4	5	0	0	-1	-1	-1	-2
20	68	0	0	2	4	6	9	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	2	4	6	8	0	0	1	2	3	4	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
300	-5	-3	0	2	4	-3	-2	-1	0	0	1	1	1
280	-5	-2	0	2	3	-2	-1	0	0	1	1	1	1
260	-4	-2	0	2	3	-1	-1	0	0	1	1	1	1
240	-3	-1	0	2	3	-1	-1	0	0	1	1	1	1
220	-3	-1	0	2	3	-1	-1	0	0	1	1	1	2
200	-3	-1	0	2	3	-1	-1	0	0	1	1	2	2
180	-2	-1	0	2	3	-1	-1	0	0	1	1	2	2
160	-3	-1	0	2	3	-2	-1	0	0	1	1	2	3

ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
300	-15.4	-17.1	-18.9	-17.8	-19.5	-21.2	-24.0	-25.7	-27.5
280	-14.3	-16.0	-17.7	-16.4	-18.2	-19.9	-21.9	-23.7	-25.4
260	-13.1	-14.9	-16.6	-15.1	-16.9	-18.6	-19.8	-21.7	-23.9
240	-15.5	-18.2	-20.9	-18.3	-21.0	-23.7	-24.4	-27.5	-30.8
220	-18.4	-21.7	-25.6	-21.3	-25.1	-28.9	-28.3	-32.1	-36.0
200	-19.3	-23.3	-27.5	-21.9	-26.1	-30.2	-27.9	-32.0	-36.2
180	-17.2	-21.4	-25.5	-19.1	-23.3	-27.4	-23.5	-27.6	-31.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400							139.2		
1600	177.6			193.5			221.9	165.8	
1800	258.3	203.6	148.8	276.0	219.7	164.8	313.0	249.7	192.4
2000		284.3	229.1		303.4	245.7			278.3
2200			311.1			331.7			

1. **Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -40 m/+40 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
280	-13	-8	-3	-7	-2	2	4	9	14
260	-16	-11	-6	-10	-5	0	2	7	11
240	-18	-13	-9	-13	-8	-3	-1	4	8
220	-20	-15	-10	-15	-10	-6	-4	0	5
200	-20	-15	-11	-16	-12	-7	-7	-2	3
180	-22	-17	-12	-19	-14	-9	-11	-6	-1
160	-23	-18	-14	-20	-15	-11	-14	-9	-5

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 Slippery Runway Takeoff
20% Thrust Reduction
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	0.0	-1.6	-3.2	-7.4	-9.0	-10.5	-22.4	-24.0	-25.6
300	0.0	-1.6	-3.2	-9.3	-10.9	-12.5	-23.2	-24.8	-26.4
280	0.0	-1.6	-3.2	-11.3	-12.9	-14.5	-24.3	-25.9	-27.5
260	0.0	-1.6	-3.2	-13.4	-15.1	-16.7	-25.6	-27.3	-28.9
240	-1.4	-3.0	-4.7	-14.7	-16.4	-18.1	-25.9	-27.6	-29.3
220	-2.7	-4.4	-6.1	-15.0	-16.8	-18.5	-25.1	-26.9	-28.6
200	-3.4	-5.2	-6.9	-14.5	-16.3	-18.1	-23.3	-25.1	-26.9
180	-3.4	-5.2	-7.0	-13.1	-14.9	-16.7	-20.4	-22.3	-24.1

V1(MCG) Limit Weight (1000 KG)

FIELD LENGTH AVAILABLE (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1200	211.9	156.9							
1400	340.2	296.3	249.5						
1600				202.6	149.8				
1800				304.0	247.5	193.2			
2000					351.8	293.9	156.2		
2200							210.8	160.6	
2400							272.7	215.8	165.2
2600							344.8	278.5	220.8
2800								351.2	284.3
3000									357.6

1. **Enter Weight Adjustment table with reported braking action and TO2 field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -21 m/+21 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30 m/+30 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 m/+45 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
280	-4	-3	-2	-12	-11	-9	-23	-21	-20
260	-6	-4	-3	-14	-13	-11	-26	-24	-23
240	-7	-6	-5	-17	-15	-14	-29	-27	-26
220	-9	-7	-6	-19	-17	-16	-32	-30	-28
200	-10	-9	-7	-21	-19	-17	-34	-33	-31
180	-11	-10	-8	-22	-20	-19	-36	-35	-33
160	-12	-11	-9	-23	-21	-20	-38	-36	-34

1. **Obtain V1, VR and V2 for the actual weight.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 Takeoff Speeds

20% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
260	171	176	179	162	166	169			
250	168	172	176	158	162	166	154	155	159
240	164	169	173	155	159	163	150	152	156
230	160	165	170	151	155	160	146	149	153
220	156	161	166	147	152	157	143	145	150
210	151	157	163	143	148	154	139	141	147
200	146	152	159	138	143	150	134	137	144
190	141	148	155	133	139	147	129	133	140
180	136	143	151	128	135	143	125	129	137
170	131	139	147	123	131	139	120	125	133
160	126	134	143	118	126	135	114	121	129

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)						PRESSURE ALT (1000 FT)					
°C	°F	-2	0	2	2	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	6	7	9	11			3	4	4	5			-2	-2	-2	-2		
50	122	3	4	6	8	10	12	2	2	3	4	5	6	-1	-1	-1	-2	-2	-2
40	104	1	2	4	6	8	10	1	1	2	3	4	5	0	-1	-1	-1	-2	-2
30	86	0	0	2	4	6	8	0	0	1	2	3	4	0	0	-1	-1	-1	-2
20	68	0	0	2	3	5	7	0	0	1	2	3	4	0	0	0	-1	-1	-1
-60	-76	0	0	2	3	5	7	0	0	1	2	3	3	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
260	-4	-2	0	1	2	-2	-1	-1	0	0	0	0	0
240	-4	-2	0	1	2	-1	-1	-1	0	0	0	0	0
220	-3	-2	0	1	2	-1	-1	-1	0	0	0	0	1
200	-3	-1	0	1	2	-1	-1	0	0	0	1	1	1
180	-2	-1	0	1	2	-1	-1	0	0	0	1	1	2
160	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2

Minimum Control Speeds

V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	98	102	94	100		
50	122	100	105	94	100	90	96
40	104	106	110	97	102	90	96
30	86	109	114	101	106	93	98
20	68	110	114	103	108	95	100
-60	-76	111	114	104	108	97	102

TO1 V1(MCG), Minimum VR
8% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	94	98	91	96		
50	122	96	101	91	96	87	92
40	104	101	106	93	98	87	92
30	86	105	109	96	101	89	95
20	68	105	110	98	103	91	97
-60	-76	106	110	99	104	93	98

TO2 V1(MCG), Minimum VR
20% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	87	92	84	89		
50	122	89	94	84	89	81	86
40	104	94	99	87	92	81	86
30	86	97	102	90	95	83	88
20	68	98	102	92	97	85	90
-60	-76	99	103	93	97	87	91

Go-around EPR

Based on engine bleed for packs on and anti-ice off

REPORTED OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
66	150	70	1.269	1.282	1.284	1.287	1.289	1.290	1.290	1.289	1.287	1.284	1.281	1.278
56	133	60	1.316	1.324	1.328	1.332	1.335	1.337	1.339	1.339	1.338	1.336	1.334	1.332
51	124	55	1.347	1.356	1.356	1.355	1.359	1.361	1.363	1.365	1.364	1.362	1.361	1.359
46	115	50	1.380	1.390	1.392	1.392	1.388	1.387	1.388	1.390	1.389	1.388	1.388	1.387
41	106	45	1.406	1.429	1.428	1.428	1.421	1.416	1.416	1.416	1.415	1.414	1.414	1.414
36	97	40	1.431	1.461	1.461	1.460	1.453	1.446	1.445	1.445	1.444	1.443	1.442	1.441
31	88	35	1.443	1.492	1.491	1.491	1.483	1.477	1.475	1.474	1.473	1.473	1.472	1.471
26	79	30	1.443	1.498	1.511	1.518	1.512	1.505	1.506	1.505	1.504	1.504	1.502	1.502
21	70	25	1.443	1.498	1.511	1.521	1.526	1.531	1.527	1.529	1.528	1.527	1.525	1.525
17	62	20	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.545	1.546	1.541	1.539
12	53	15	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.561
8 & BELOW	46 & BELOW	12 & BELOW	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.571

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-1000	0	2000	4000	6000	8000	10000
PACKS OFF	0.003	0.003	0.003	0.003	0.004	0.004	0.005
1 PACK ON - 2 BLEED SOURCES	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.004
1 PACK ON - 1 BLEED SOURCE	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.004
WING ANTI-ICE ON	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002

Max Climb EPR

Based on engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	1.132	1.122	1.127	1.146	1.166	1.159	1.152	1.174	1.178	1.170
50	1.168	1.161	1.147	1.146	1.166	1.159	1.152	1.174	1.178	1.170
40	1.209	1.205	1.191	1.184	1.173	1.159	1.152	1.174	1.178	1.170
30	1.217	1.253	1.243	1.237	1.228	1.196	1.157	1.174	1.178	1.170
20	1.217	1.253	1.284	1.298	1.292	1.259	1.228	1.191	1.178	1.170
10	1.217	1.253	1.284	1.329	1.364	1.337	1.307	1.273	1.260	1.257
0	1.217	1.253	1.284	1.329	1.374	1.399	1.402	1.367	1.351	1.348
-10	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.482	1.468	1.465
-15 & BELOW	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.506	1.521	1.518

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003	-0.004	-0.005
ENGINE & WING 1	-0.010	-0.012	-0.018	-0.020	-0.012	-0.012	-0.011	-0.014	-0.017	-0.019
ENGINE & WING 2	-0.012	-0.014	-0.021	-0.025	-0.018	-0.019	-0.020	-0.024	-0.029	-0.033

Wing 1: Wing anti-ice on, packs on.
Wing 2: Wing anti-ice on, single bleed source and both packs off.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280	320
40000 (.82M)	**PITCH ATT**	**3.5**	**3.5**			
	V/S (FT/MIN)	1400	700			
30000 (280 KIAS)	**PITCH ATT**	**4.5**	**4.0**	**4.0**	**4.0**	
	V/S (FT/MIN)	2200	1600	1100	700	
20000 (270 KIAS)	**PITCH ATT**	**7.0**	**6.5**	**6.5**	**6.5**	**6.5**
	V/S (FT/MIN)	3600	2700	2000	1500	1100
10000 (270 KIAS)	**PITCH ATT**	**9.5**	**8.5**	**8.0**	**7.5**	**8.0**
	V/S (FT/MIN)	4400	3400	2600	2100	1600
SEA LEVEL (270 KIAS)	**PITCH ATT**	**12.0**	**10.5**	**9.5**	**9.0**	**9.0**
	V/S (FT/MIN)	5000	3900	3100	2500	2000

Cruise

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280	320
40000 (.82M)	**PITCH ATT**	**2.0**	**2.5**			
	EPR	1.152	1.269			
	(Alt Mode %N1)	(80.0)	(84.1)			
35000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**	
	EPR	1.081	1.136	1.214	1.362	
	(Alt Mode %N1)	(77.3)	(79.7)	(82.7)	(87.4)	
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.5**	
	EPR	1.038	1.075	1.127	1.204	
	(Alt Mode %N1)	(74.1)	(76.0)	(78.6)	(82.0)	
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**	**4.0**
	EPR	1.010	1.038	1.077	1.130	1.202
	(Alt Mode %N1)	(70.7)	(72.7)	(75.0)	(77.9)	(81.6)
20000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**4.0**	**5.0**
	EPR	0.995	1.017	1.047	1.088	1.142
	(Alt Mode %N1)	(66.3)	(68.6)	(71.1)	(74.1)	(77.5)
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**4.0**	**5.0**
	EPR	0.983	1.001	1.024	1.053	1.091
	(Alt Mode %N1)	(62.5)	(64.8)	(67.5)	(70.4)	(73.6)

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	200	240	280	320
40000 (.82M)	**PITCH ATT**	**-1.5**	**-0.5**			
	V/S (FT/MIN)	-2600	-2500			
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**	
	V/S (FT/MIN)	-2200	-2000	-1900	-1900	
20000 (270 KIAS)	**PITCH ATT**	**-1.0**	**0.0**	**0.5**	**1.5**	**2.5**
	V/S (FT/MIN)	-1900	-1700	-1600	-1600	-1600
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**	**2.0**
	V/S (FT/MIN)	-1700	-1500	-1400	-1400	-1400
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-2.0**	**-0.5**	**0.5**	**1.0**	**2.0**
	V/S (FT/MIN)	-1500	-1300	-1300	-1200	-1200

Holding

Flaps Up, Set Thrust for Level Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 160	200	240	280	320
10000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**	**4.5**
	EPR	1.008	1.021	1.033	1.044	1.056
	(Alt Mode %N1)	(52.3)	(57.6)	(62.4)	(66.4)	(69.9)
	KIAS	201	217	234	253	272
5000	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.0**	**5.0**
	EPR	1.003	1.013	1.022	1.030	1.038
	(Alt Mode %N1)	(48.3)	(53.6)	(58.2)	(62.3)	(66.0)
	KIAS	201	217	233	251	269

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 160	200	240	280	320
FLAPS 0 (GEAR UP) (VREF30 + 80)	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.5**	**5.5**
	EPR	1.000	1.010	1.020	1.040	1.050
	(Alt Mode %N1)	(48.8)	(54.4)	(59.2)	(63.7)	(67.6)
	KIAS	201	217	230	242	256
FLAPS 1 (GEAR UP) (VREF30 + 60)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**7.0**	**7.0**
	EPR	1.020	1.030	1.050	1.060	1.080
	(Alt Mode %N1)	(49.9)	(56.0)	(61.3)	(65.7)	(69.3)
	KIAS	181	197	210	222	236
FLAPS 5 (GEAR UP) (VREF30 + 40)	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	EPR	1.030	1.050	1.070	1.080	1.100
	(Alt Mode %N1)	(50.2)	(57.1)	(62.3)	(66.7)	(70.4)
	KIAS	161	177	190	202	216
FLAPS 15 (GEAR UP) (VREF30 + 20)	**PITCH ATT**	**5.0**	**6.0**	**6.0**	**6.5**	**6.5**
	EPR	1.040	1.060	1.090	1.110	1.130
	(Alt Mode %N1)	(51.7)	(58.8)	(64.4)	(68.9)	(72.4)
	KIAS	141	157	170	182	196
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	**PITCH ATT**	**4.0**	**4.5**	**5.0**	**5.5**	**5.0**
	EPR	1.070	1.100	1.130	1.170	1.200
	(Alt Mode %N1)	(59.2)	(65.8)	(70.7)	(75.0)	(78.7)
	KIAS	141	157	170	182	196

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		160	200	240	280	320
FLAPS 20 (VREF20 + 10)	**PITCH ATT**	**1.0**	**1.5**	**1.5**	**1.5**	**1.5**
	EPR	1.010	1.010	1.020	1.020	1.030
	(Alt Mode %N1)	(35.5)	(40.5)	(45.2)	(49.5)	(53.5)
	KIAS	144	160	175	187	199
FLAPS 25 (VREF25 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.0**	**1.5**
	EPR	1.030	1.040	1.060	1.070	1.090
	(Alt Mode %N1)	(44.7)	(51.3)	(56.8)	(61.1)	(65.0)
	KIAS	137	153	167	179	190
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
	EPR	1.050	1.070	1.090	1.110	1.130
	(Alt Mode %N1)	(51.6)	(57.7)	(62.9)	(67.1)	(70.9)
	KIAS	131	147	160	172	186

Intentionally
Blank

Performance Inflight - All Engine

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20(33°)	1.25(36°)	1.30(39°)	1.40(44°)	1.50(48°)
300	29700	0	33500*	33500*	33500*	33500*	32100
290	30500	-2	34300*	34300*	34300*	34300	32900
280	31200	-4	35200*	35200*	35200*	35100	33600
270	32000	-5	36100*	36100*	36100*	35800	34400
260	32800	-7	36700*	36700*	36700*	36600	35200
250	33700	-9	37500*	37500*	37500*	37400	36000
240	34500	-11	38300*	38300*	38300*	38300	36800
230	35400	-13	39100*	39100*	39100*	39100*	37700
220	36400	-15	40000*	40000*	40000*	40000*	38700
210	37300	-15	41000*	41000*	41000*	41000	39600
200	38300	-15	41900*	41900*	41900*	41900*	40600
190	39400	-15	42900*	42900*	42900*	42900*	41700
180	40500	-15	43100	43100	43100	43100	42800
170	41700	-15	43100	43100	43100	43100	43100
160	43000	-15	43100	43100	43100	43100	43100

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20(33°)	1.25(36°)	1.30(39°)	1.40(44°)	1.50(48°)
300	29700	5	32400*	32400*	32400*	32400*	32100
290	30500	4	33300*	33300*	33300*	33300*	32900
280	31200	2	34200*	34200*	34200*	34200*	33600
270	32000	0	35100*	35100*	35100*	35100*	34400
260	32800	-2	36100*	36100*	36100*	36100*	35200
250	33700	-3	36700*	36700*	36700*	36700*	36000
240	34500	-5	37500*	37500*	37500*	37500*	36800
230	35400	-7	38300*	38300*	38300*	38300*	37700
220	36400	-9	39200*	39200*	39200*	39200*	38700
210	37300	-9	40100*	40100*	40100*	40100*	39600
200	38300	-9	41100*	41100*	41100*	41100*	40600
190	39400	-9	42100*	42100*	42100*	42100*	41700
180	40500	-9	43100	43100	43100	43100	42800
170	41700	-9	43100	43100	43100	43100	43100
160	43000	-9	43100	43100	43100	43100	43100

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20(33°)	1.25(36°)	1.30(39°)	1.40(44°)	1.50(48°)
300	29700	11	30900*	30900*	30900*	30900*	30900*
290	30500	9	31900*	31900*	31900*	31900*	31900*
280	31200	8	32900*	32900*	32900*	32900*	32900*
270	32000	6	33800*	33800*	33800*	33800*	33800*
260	32800	4	34800*	34800*	34800*	34800*	34800*
250	33700	2	35800*	35800*	35800*	35800*	35800*
240	34500	0	36500*	36500*	36500*	36500*	36500*
230	35400	-2	37400*	37400*	37400*	37400*	37400*
220	36400	-3	38200*	38200*	38200*	38200*	38200*
210	37300	-3	39100*	39100*	39100*	39100*	39100*
200	38300	-3	40000*	40000*	40000*	40000*	40000*
190	39400	-3	41000*	41000*	41000*	41000*	41000*
180	40500	-3	42100*	42100*	42100*	42100*	42100*
170	41700	-3	43100	43100	43100	43100	43100
160	43000	-3	43100	43100	43100	43100	43100

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
300	EPR	1.112	1.138	1.173	1.235	1.329					
	MACH	.772	.802	.834	.838	.837					
	KIAS	325	325	325	313	299					
	FF/ENG	4494	4550	4631	4638	4719					
280	EPR	1.092	1.116	1.147	1.189	1.257	1.370				
	MACH	.772	.802	.827	.838	.838	.836				
	KIAS	325	325	322	313	299	286				
	FF/ENG	4291	4359	4377	4329	4323	4451				
260	EPR	1.075	1.096	1.122	1.156	1.203	1.279	1.415			
	MACH	.767	.790	.813	.830	.839	.837	.836			
	KIAS	322	319	316	310	300	286	273			
	FF/ENG	4089	4074	4085	4047	4007	4014	4216			
240	EPR	1.060	1.079	1.101	1.129	1.164	1.216	1.300			
	MACH	.744	.769	.792	.815	.832	.839	.837			
	KIAS	312	310	307	304	297	287	273			
	FF/ENG	3789	3763	3757	3760	3721	3688	3729			
220	EPR	1.048	1.063	1.082	1.105	1.133	1.170	1.226	1.316		
	MACH	.718	.745	.769	.794	.817	.833	.839	.837		
	KIAS	301	300	298	295	291	284	274	261		
	FF/ENG	3482	3465	3441	3440	3436	3399	3392	3462		
200	EPR	1.036	1.049	1.064	1.083	1.107	1.136	1.174	1.232	1.322	
	MACH	.689	.716	.743	.768	.793	.816	.833	.839	.837	
	KIAS	288	287	286	284	282	278	272	261	249	
	FF/ENG	3168	3159	3143	3122	3121	3116	3102	3116	3181	
180	EPR	1.024	1.036	1.049	1.064	1.083	1.107	1.136	1.175	1.231	1.319
	MACH	.660	.684	.711	.739	.765	.790	.814	.832	.839	.837
	KIAS	275	274	273	273	271	268	265	259	250	238
	FF/ENG	2918	2900	2888	2825	2806	2802	2816	2826	2837	2888
160	EPR	1.013	1.023	1.035	1.048	1.063	1.081	1.105	1.134	1.172	1.222
	MACH	.627	.652	.676	.703	.731	.759	.784	.809	.828	.838
	KIAS	260	260	259	258	258	256	254	251	246	238
	FF/ENG	2614	2596	2577	2518	2508	2493	2500	2535	2550	2553

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
287	265	245	228	213	200	190	181	173	166	160
572	528	489	455	426	400	382	365	349	335	322
858	792	733	683	639	600	573	548	525	503	484
1146	1057	978	911	852	800	764	731	700	672	646
1434	1322	1223	1139	1066	1000	955	914	875	840	808
1723	1588	1468	1367	1279	1200	1146	1096	1049	1007	969
2013	1855	1715	1596	1492	1400	1337	1278	1225	1176	1131
2305	2123	1962	1825	1706	1600	1528	1460	1399	1343	1292
2597	2391	2209	2054	1920	1800	1719	1643	1574	1511	1453
2891	2661	2456	2283	2134	2000	1909	1825	1748	1678	1614

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:40	3.2	0:38	2.7	0:36	2.3	0:35	2.1	0:34
400	7.8	1:16	6.8	1:12	6.0	1:08	5.4	1:05	5.0	1:02
600	11.8	1:52	10.5	1:47	9.4	1:39	8.5	1:35	7.8	1:30
800	15.7	2:28	14.3	2:21	12.7	2:11	11.6	2:04	10.7	1:58
1000	19.7	3:05	18.0	2:56	15.9	2:43	14.7	2:35	13.5	2:27
1200	23.7	3:42	21.6	3:31	19.2	3:15	17.7	3:05	16.3	2:55
1400	27.6	4:19	25.3	4:06	22.4	3:48	20.7	3:35	19.1	3:24
1600	31.5	4:57	28.9	4:42	25.6	4:20	23.7	4:06	21.9	3:53
1800	35.4	5:35	32.4	5:18	28.7	4:53	26.7	4:37	24.7	4:22
2000	39.2	6:13	36.0	5:55	31.8	5:26	29.6	5:08	27.4	4:51

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)			
	150	200	250	300
5	-0.4	0.0	0.5	1.1
10	-0.8	0.0	1.2	2.6
15	-1.3	0.0	1.9	4.0
20	-1.8	0.0	2.6	5.5
25	-2.3	0.0	3.2	6.9
30	-2.9	0.0	3.8	8.2
35	-3.5	0.0	4.3	9.6
40	-4.1	0.0	4.9	10.9
45	-4.7	0.0	5.4	12.2
50	-5.3	0.0	5.9	13.5

Based on Long Range Cruise and .84/310/250 descent.

Long Range Cruise Enroute Fuel and Time - High Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
1307	1232	1165	1104	1050	1000	959	921	886	853	823
1961	1849	1746	1656	1575	1500	1439	1382	1329	1280	1235
2618	2468	2330	2209	2100	2000	1918	1842	1771	1706	1647
3278	3088	2916	2763	2626	2500	2398	2303	2215	2133	2058
3943	3713	3504	3319	3152	3000	2877	2762	2656	2558	2469
4611	4340	4093	3875	3679	3500	3356	3222	3098	2983	2878
5282	4969	4684	4432	4207	4000	3835	3681	3538	3407	3287
5958	5601	5277	4991	4734	4500	4313	4139	3978	3830	3694
6638	6236	5871	5550	5263	5000	4792	4598	4418	4252	4101
7323	6875	6469	6111	5792	5500	5270	5055	4857	4673	4506
8012	7517	7068	6673	6321	6000	5747	5512	5294	5094	4911
8707	8163	7670	7237	6852	6500	6224	5968	5731	5513	5314
9407	8813	8275	7803	7383	7000	6702	6424	6167	5931	5716
10113	9466	8881	8369	7914	7500	7178	6879	6602	6348	6116
10824	10124	9491	8938	8447	8000	7654	7333	7036	6763	6515

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 29 FUEL (1000 KG)	29 TIME (HR:MIN)	31 FUEL (1000 KG)	31 TIME (HR:MIN)	33 FUEL (1000 KG)	33 TIME (HR:MIN)	35 FUEL (1000 KG)	35 TIME (HR:MIN)	37 FUEL (1000 KG)	37 TIME (HR:MIN)
1000	13.2	2:24	12.7	2:21	12.3	2:18	12.0	2:15	11.8	2:13
1500	20.0	3:35	19.3	3:29	18.8	3:25	18.4	3:20	17.9	3:17
2000	26.9	4:46	25.8	4:39	25.1	4:32	24.5	4:26	24.0	4:21
2500	33.5	5:59	32.2	5:49	31.2	5:41	30.5	5:33	29.9	5:26
3000	40.1	7:13	38.4	7:01	37.3	6:50	36.4	6:41	35.7	6:32
3500	46.5	8:29	44.5	8:14	43.2	8:00	42.1	7:49	41.3	7:38
4000	52.8	9:46	50.5	9:28	49.0	9:12	47.8	8:58	46.8	8:45
4500	58.9	11:04	56.5	10:43	54.8	10:25	53.3	10:09	52.2	9:53
5000	64.9	12:23	62.3	12:00	60.5	11:39	58.8	11:20	57.5	11:02
5500	70.8	13:45	68.1	13:18	66.0	12:54	64.2	12:32	62.8	12:12
6000	76.5	15:07	73.7	14:37	71.5	14:11	69.5	13:46	67.9	13:23
6500	82.2	16:32	79.2	15:58	76.8	15:29	74.7	15:01	73.0	14:34
7000	87.8	17:58	84.5	17:21	82.0	16:48	79.8	16:18	77.9	15:48
7500	93.3	19:26	89.8	18:45	87.1	18:09	84.7	17:35	82.8	17:02
8000	98.7	20:56	95.0	20:11	92.1	19:31	89.6	18:55	87.5	18:18

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG) 150	200	250	300
10	-1.1	0.0	2.2	8.7
20	-2.5	0.0	4.2	13.7
30	-3.8	0.0	6.2	18.3
40	-5.2	0.0	8.0	22.5
50	-6.5	0.0	9.6	26.3
60	-7.9	0.0	11.2	29.6
70	-9.3	0.0	12.7	32.5
80	-10.7	0.0	14.1	35.0
90	-12.1	0.0	15.4	37.1
100	-13.5	0.0	16.5	38.8
110	-14.9	0.0	17.6	40.0

Based on Long Range Cruise and .84/310/250 descent.

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)							
	300	280	260	240	220	200	180	160
43						38	10	0
41					37	11	0	3
39				34	11	0	2	12
37		59	29	10	0	1	9	25
35	46	22	7	0	1	8	21	39
33	16	5	0	2	8	20	36	55
31	3	0	2	9	20	34	51	70
29	0	3	10	20	33	48	66	85
27	5	12	21	33	47	63	80	99
25	14	23	35	47	62	78	94	112

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent at .84/310/250

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	94	101	109	116	122	127	133	139	144	149
TIME (MINUTES)	20	21	22	23	23	24	25	25	26	27

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	EPR	1.026	1.034	1.050	1.064	1.080	1.127	1.201			
	KIAS	260	260	262	277	302	306	311			
	FF/ENG	4340	4300	4200	4220	4410	4500	4700			
280	EPR	1.023	1.030	1.044	1.061	1.073	1.113	1.174	1.362		
	KIAS	251	251	253	261	286	295	299	279		
	FF/ENG	4060	4020	3920	3900	4040	4150	4300	4540		
260	EPR	1.020	1.026	1.038	1.058	1.070	1.099	1.152	1.276		
	KIAS	242	242	243	246	266	283	287	279		
	FF/ENG	3790	3740	3720	3590	3680	3820	3940	4090		
240	EPR	1.017	1.022	1.033	1.050	1.067	1.082	1.132	1.214		
	KIAS	232	233	234	235	247	272	275	279		
	FF/ENG	3590	3460	3500	3370	3400	3490	3570	3750		
220	EPR	1.013	1.018	1.028	1.042	1.063	1.075	1.114	1.178	1.374	
	KIAS	224	224	224	224	230	251	262	266	249	
	FF/ENG	3320	3270	3220	3090	3090	3120	3230	3340	3630	
200	EPR	1.009	1.013	1.021	1.033	1.054	1.071	1.095	1.150	1.269	
	KIAS	217	217	217	217	217	229	249	253	249	
	FF/ENG	3050	3000	2950	2890	2800	2840	2900	2990	3190	
180	EPR	1.005	1.008	1.014	1.024	1.040	1.066	1.080	1.125	1.203	1.312
	KIAS	209	209	209	209	209	209	230	239	242	232
	FF/ENG	2860	2740	2690	2620	2590	2520	2550	2630	2820	2940
160	EPR	1.001	1.003	1.008	1.016	1.028	1.048	1.073	1.102	1.163	1.222
	KIAS	201	201	201	201	201	201	206	224	227	229
	FF/ENG	2610	2550	2440	2360	2320	2240	2260	2350	2490	2570

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000
300	EPR	1.058	1.071	1.098	1.137	1.195
	KIAS	229	229	229	229	229
	FF/ENG	4640	4490	4520	4500	4530
280	EPR	1.052	1.063	1.086	1.122	1.173
	KIAS	222	222	222	222	222
	FF/ENG	4320	4280	4190	4170	4180
260	EPR	1.044	1.055	1.074	1.105	1.149
	KIAS	216	216	216	216	216
	FF/ENG	4010	3960	3860	3830	3840
240	EPR	1.037	1.046	1.062	1.088	1.126
	KIAS	210	210	210	210	210
	FF/ENG	3700	3650	3630	3560	3570
220	EPR	1.030	1.038	1.052	1.073	1.106
	KIAS	204	204	204	204	204
	FF/ENG	3460	3420	3390	3250	3250
200	EPR	1.024	1.031	1.043	1.060	1.087
	KIAS	197	197	197	197	197
	FF/ENG	3160	3120	3080	2950	2930
180	EPR	1.019	1.024	1.035	1.048	1.069
	KIAS	189	189	189	189	189
	FF/ENG	2870	2820	2790	2720	2630
160	EPR	1.014	1.018	1.026	1.038	1.054
	KIAS	181	181	181	181	181
	FF/ENG	2650	2600	2500	2430	2400

This table includes 5% additional fuel for holding in a racetrack pattern.

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ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	895	+25/-15	20	-35	135	10	-10	20	-20	70	10	25
MAX AUTO	1200	+20/-15	30	-50	185	0	0	30	-30	125	0	0
AUTOBRAKE 4	1490	+25/-20	40	-70	260	0	-5	40	-40	160	0	0
AUTOBRAKE 3	1795	+35/-30	50	-90	325	10	-10	50	-50	190	0	5
AUTOBRAKE 2	2015	+40/-35	60	-105	375	15	-40	55	-55	175	15	15
AUTOBRAKE 1	2155	+45/-40	65	-115	420	45	-60	60	-60	165	120	125

Good Reported Braking Action

MAX MANUAL	1235	+20/-20	30	-60	230	35	-25	30	-30	100	55	130
MAX AUTO	1355	+25/-25	35	-65	240	25	-20	30	-30	120	60	140
AUTOBRAKE 4	1490	+25/-30	40	-75	265	10	-10	40	-40	160	5	25
AUTOBRAKE 3	1790	+35/-35	50	-90	325	10	-10	50	-50	190	0	5

Medium Reported Braking Action

MAX MANUAL	1660	+35/-35	50	-95	385	80	-60	45	-45	125	160	405
MAX AUTO	1745	+35/-35	50	-95	380	75	-50	45	-45	150	155	400
AUTOBRAKE 4	1745	+35/-35	50	-95	385	80	-50	45	-45	145	170	425
AUTOBRAKE 3	1880	+35/-35	55	-105	405	55	-35	50	-50	190	85	290

Poor Reported Braking Action

MAX MANUAL	2125	+50/-45	70	-145	610	200	-120	55	-55	145	355	965
MAX AUTO	2245	+50/-45	70	-140	605	200	-120	55	-55	145	355	975
AUTOBRAKE 4	2245	+50/-45	70	-140	605	195	-120	55	-55	145	360	990
AUTOBRAKE 3	2245	+50/-45	70	-145	610	200	-100	60	-60	185	350	980

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	930	+25/-15	20	-40	135	10	-10	20	-20	70	15	30
MAX AUTO	1270	+20/-15	30	-55	190	0	0	30	-30	130	0	0
AUTOBRAKE 4	1585	+30/-20	40	-75	270	0	-10	45	-45	165	0	0
AUTOBRAKE 3	1915	+35/-30	55	-95	335	15	-15	55	-55	190	5	5
AUTOBRAKE 2	2140	+45/-40	65	-110	385	30	-50	60	-60	165	40	40
AUTOBRAKE 1	2260	+50/-45	70	-120	430	55	-65	65	-65	165	165	175

Good Reported Braking Action

MAX MANUAL	1285	+25/-25	35	-65	235	35	-30	30	-30	100	65	150
MAX AUTO	1420	+25/-25	35	-65	245	25	-20	35	-35	120	70	165
AUTOBRAKE 4	1585	+30/-30	45	-75	275	5	-10	45	-45	165	5	25
AUTOBRAKE 3	1910	+35/-40	55	-95	335	15	-15	55	-55	190	5	5

Medium Reported Braking Action

MAX MANUAL	1730	+35/-35	55	-100	390	80	-60	45	-45	125	185	470
MAX AUTO	1820	+35/-35	55	-95	385	75	-50	45	-45	150	180	460
AUTOBRAKE 4	1820	+35/-35	55	-100	390	75	-45	45	-45	160	180	480
AUTOBRAKE 3	1995	+40/-40	55	-110	415	55	-40	55	-55	190	85	315

Poor Reported Braking Action

MAX MANUAL	2205	+50/-50	75	-145	615	200	-120	60	-60	145	395	1115
MAX AUTO	2335	+50/-50	75	-145	610	205	-120	60	-60	145	400	1130
AUTOBRAKE 4	2335	+50/-50	75	-145	615	195	-120	60	-60	145	405	1145
AUTOBRAKE 3	2335	+50/-50	75	-145	620	195	-100	60	-60	190	375	1115

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	985	+30/-15	20	-40	135	15	-10	20	-20	75	15	40
MAX AUTO	1355	+25/-25	35	-55	190	0	0	35	-35	135	0	0
AUTOBRAKE 4	1705	+30/-35	45	-80	270	0	-10	50	-50	175	0	0
AUTOBRAKE 3	2035	+40/-40	60	-100	335	15	-20	60	-60	200	5	5
AUTOBRAKE 2	2250	+50/-50	70	-115	385	35	-50	65	-65	185	55	55
AUTOBRAKE 1	2385	+55/-55	80	-125	430	65	-75	70	-70	180	195	205

Good Reported Braking Action

MAX MANUAL	1380	+25/-25	40	-65	230	35	-30	35	-35	105	75	180
MAX AUTO	1445	+25/-30	40	-70	240	25	-20	35	-35	125	85	195
AUTOBRAKE 4	1710	+30/-35	45	-80	275	5	-10	50	-50	175	5	30
AUTOBRAKE 3	2035	+40/-40	60	-100	335	15	-20	60	-60	200	5	5

Medium Reported Braking Action

MAX MANUAL	1865	+40/-40	60	-105	375	85	-65	50	-50	135	220	565
MAX AUTO	1865	+40/-40	60	-100	375	75	-55	50	-50	155	210	555
AUTOBRAKE 4	1885	+40/-40	60	-105	380	70	-50	50	-50	165	210	575
AUTOBRAKE 3	2120	+45/-45	60	-115	410	50	-40	60	-60	200	95	375

Poor Reported Braking Action

MAX MANUAL	2385	+55/-55	85	-150	585	195	-130	65	-65	155	465	1345
MAX AUTO	2385	+55/-55	85	-150	580	195	-130	65	-65	150	470	1360
AUTOBRAKE 4	2385	+55/-55	85	-150	585	185	-130	65	-65	150	475	1380
AUTOBRAKE 3	2415	+55/-55	80	-155	590	180	-105	70	-70	195	430	1340

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 65 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1730	35/-35	55	-100/375	80/-60	25/-25	125	185	465
ANTISKID (FLAPS 30)	VREF30	1660	35/-35	50	-100/370	80/-60	25/-25	125	160	400
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1000	35/-15	25	-45/145	15/-10	10/-10	80	-	25
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	905	25/-15	20	-35/140	10/-10	10/-10	75	-	15
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1210	45/-25	35	-45/190	20/-15	20/-15	95	40	100
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1040	35/-15	25	-45/150	15/-15	10/-15	80	25	60
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	985	30/-15	25	-45/145	15/-10	10/-10	75	20	45
FLAPS PRIMARY FAIL	VREF20	1110	30/-15	25	-45/150	15/-15	15/-15	90	25	50
FLAP/SLAT CONTROL	VREF20	975	30/-15	25	-40/145	15/-10	10/-10	75	20	45
FLIGHT CONTROL MODE	VREF20	1130	30/-20	25	-45/160	15/-15	15/-15	100	25	55
HYD PRESS SYS C	VREF20	1110	30/-15	25	-45/150	15/-15	15/-15	90	25	50
HYD PRESS SYS L+C	VREF30+20	1255	35/-20	30	-50/170	20/-20	15/-15	120	-	35
HYD PRESS SYS L+R	VREF30+20	1455	25/-25	40	-65/215	40/-35	20/-20	145	-	-
HYD PRESS SYS R+C	VREF30+20	1560	25/-25	45	-65/230	40/-35	20/-20	160	-	100
HYD PRESS SYS L (FLAPS 25)	VREF25	990	30/-15	25	-45/145	15/-15	10/-10	85	-	25
HYD PRESS SYS L (FLAPS 30)	VREF30	955	25/-15	20	-40/145	15/-10	10/-10	85	-	20
HYD PRESS SYS R (FLAPS 25)	VREF25	1155	20/-20	25	-50/185	25/-20	15/-15	105	-	45
HYD PRESS SYS R (FLAPS 30)	VREF30	1100	20/-20	25	-50/175	25/-20	15/-15	105	-	35
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1180	45/-20	35	-45/180	20/-15	15/-15	85	35	75
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1020	35/-15	25	-45/150	15/-10	10/-10	75	20	50
PRI FLIGHT COMPUTERS	VREF20	1130	30/-20	25	-45/160	15/-15	15/-15	100	25	55
SLATS DRIVE	VREF30+30	1125	35/-15	30	-45/160	15/-15	15/-15	80	25	60
STABILIZER	VREF30+20	1045	35/-15	25	-45/150	15/-10	15/-15	80	25	50

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1730	35/-35	55	-100/375	80/-60	25/-25	125	185	465
ANTISKID (FLAPS 30)	VREF30	1660	35/-35	50	-100/370	80/-60	25/-25	125	160	400
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1440	25/-25	40	-70/250	45/-35	20/-20	115	-	100
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1275	25/-25	35	-65/230	35/-30	20/-20	110	-	65
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1625	25/-25	50	-70/255	40/-35	25/-25	105	115	275
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1460	25/-25	45	-65/245	35/-30	20/-20	110	95	225
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1380	25/-25	40	-65/240	35/-30	20/-20	105	75	180
FLAPS PRIMARY FAIL	VREF20	1520	25/-30	45	-70/255	45/-35	20/-20	130	95	220
FLAP/SLAT CONTROL	VREF20	1360	25/-25	35	-65/235	35/-30	20/-20	105	75	175
FLIGHT CONTROL MODE	VREF20	1565	30/-30	45	-75/260	45/-35	20/-20	140	105	245
HYD PRESS SYS C	VREF20	1520	25/-30	45	-70/255	45/-35	20/-20	130	95	220
HYD PRESS SYS L+C	VREF30+20	1815	30/-35	50	-80/295	65/-50	25/-25	170	-	175
HYD PRESS SYS L+R	VREF30+20	1895	35/-35	55	-90/315	80/-65	30/-30	190	-	-
HYD PRESS SYS R+C	VREF30+20	1865	35/-35	55	-85/300	65/-55	25/-25	185	-	190
HYD PRESS SYS L (FLAPS 25)	VREF25	1430	25/-25	40	-70/255	45/-40	20/-20	130	-	105
HYD PRESS SYS L (FLAPS 30)	VREF30	1375	25/-25	35	-70/250	45/-35	20/-20	130	-	90
HYD PRESS SYS R (FLAPS 25)	VREF25	1430	25/-25	40	-70/255	45/-40	20/-20	130	-	105
HYD PRESS SYS R (FLAPS 30)	VREF30	1360	25/-25	35	-65/250	45/-35	20/-20	125	-	85
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1605	25/-25	45	-70/250	40/-35	25/-25	100	105	245
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1405	25/-25	40	-65/240	35/-30	20/-20	100	75	175
PRI FLIGHT COMPUTERS	VREF20	1565	30/-30	45	-75/260	45/-35	20/-20	140	105	245
SLATS DRIVE	VREF30+30	1580	25/-25	45	-70/255	40/-35	20/-20	110	100	230
STABILIZER	VREF30+20	1465	25/-25	45	-65/245	40/-35	20/-20	110	90	205

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2205	50/-50	75	-145/590	190/-120	35/-35	145	395	1115
ANTISKID (FLAPS 30)	VREF30	2130	50/-45	75	-145/585	190/-120	30/-30	145	355	965
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2035	45/-45	65	-115/420	115/-85	30/-30	150	-	320
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1785	35/-35	55	-105/395	105/-75	25/-25	140	-	225
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2225	45/-45	75	-110/410	100/-75	35/-35	135	325	890
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1975	40/-40	65	-105/395	90/-70	30/-30	140	265	705
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1865	40/-40	60	-110/385	90/-65	25/-25	135	220	560
FLAPS PRIMARY FAIL	VREF20	2025	45/-45	65	-110/410	100/-75	30/-30	160	255	675
FLAP/SLAT CONTROL	VREF20	1835	40/-40	60	-100/385	85/-65	25/-25	130	210	535
FLIGHT CONTROL MODE	VREF20	2100	45/-45	70	-115/420	110/-80	30/-30	170	285	765
HYD PRESS SYS C	VREF20	2025	45/-45	65	-110/410	100/-75	30/-30	160	255	675
HYD PRESS SYS L+C	VREF30+20	2575	55/-50	85	-135/495	175/-125	40/-40	220	-	555
HYD PRESS SYS L+R	VREF30+20	2990	55/-55	90	-160/585	280/-190	50/-50	260	-	-
HYD PRESS SYS R+C	VREF30+20	2630	55/-55	85	-135/505	180/-130	45/-45	230	-	595
HYD PRESS SYS L (FLAPS 25)	VREF25	2035	45/-45	65	-115/440	130/-95	30/-30	170	-	340
HYD PRESS SYS L (FLAPS 30)	VREF30	1955	40/-40	60	-115/435	130/-90	30/-30	170	-	295
HYD PRESS SYS R (FLAPS 25)	VREF25	2025	45/-45	65	-115/440	125/-90	30/-30	165	-	335
HYD PRESS SYS R (FLAPS 30)	VREF30	1910	40/-40	60	-115/425	120/-90	30/-30	160	-	275
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2165	45/-45	75	-110/410	90/-70	35/-35	130	280	735
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1895	40/-35	60	-105/385	85/-65	25/-25	125	215	535
PRI FLIGHT COMPUTERS	VREF20	2100	45/-45	70	-115/420	110/-80	30/-30	170	285	765
SLATS DRIVE	VREF30+30	2115	45/-40	70	-110/410	100/-75	35/-35	135	260	675
STABILIZER	VREF30+20	1970	40/-40	65	-105/395	95/-70	30/-30	135	240	610

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	3020	75/-75	115	-250/1195	775/-290	45/-45	160	1070	5000
ANTISKID (FLAPS 30)	VREF30	2925	75/-70	110	-245/1185	760/-285	45/-45	160	980	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2740	65/-65	95	-175/685	330/-175	45/-45	185	-	790
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2385	55/-55	80	-160/645	280/-155	35/-35	170	-	550
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2850	65/-60	105	-160/640	230/-145	45/-45	165	690	2190
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2525	60/-55	90	-155/620	225/-135	35/-35	160	555	1700
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2380	55/-55	85	-150/610	215/-130	35/-35	155	465	1340
FLAPS PRIMARY FAIL	VREF20	2560	60/-60	90	-160/630	240/-140	40/-40	175	535	1595
FLAP/SLAT CONTROL	VREF20	2345	55/-55	80	-150/605	210/-125	35/-35	150	445	1270
FLIGHT CONTROL MODE	VREF20	2655	65/-65	100	-165/645	255/-150	40/-40	195	595	1835
HYD PRESS SYS C	VREF20	2560	60/-60	90	-160/630	240/-140	40/-40	175	535	1595
HYD PRESS SYS L+C	VREF30+20	3490	75/-75	125	-215/825	490/-255	60/-60	255	-	1400
HYD PRESS SYS L+R	VREF30+20	4620	85/-85	135	-290/1095	1075/-480	80/-80	330	-	-
HYD PRESS SYS R+C	VREF30+20	3540	80/-75	130	-215/830	470/-260	60/-60	260	-	1465
HYD PRESS SYS L (FLAPS 25)	VREF25	2780	65/-60	95	-185/740	355/-200	45/-45	200	-	875
HYD PRESS SYS L (FLAPS 30)	VREF30	2680	60/-60	90	-185/735	355/-200	45/-45	200	-	765
HYD PRESS SYS R (FLAPS 25)	VREF25	2745	60/-60	95	-185/735	350/-195	45/-45	190	-	840
HYD PRESS SYS R (FLAPS 30)	VREF30	2585	55/-55	85	-175/715	330/-185	45/-45	185	-	690
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2750	60/-55	100	-160/630	220/-135	45/-45	150	575	1710
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2420	55/-55	85	-150/605	210/-125	35/-35	145	450	1275
PRI FLIGHT COMPUTERS	VREF20	2655	65/-65	100	-165/645	255/-150	40/-40	195	595	1835
SLATS DRIVE	VREF30+30	2670	60/-55	100	-160/630	230/-140	45/-45	155	530	1535
STABILIZER	VREF30+20	2500	55/-55	90	-150/620	225/-135	35/-35	155	490	1420

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	257.7	242.6				
52	126	263.7	248.6				
50	122	269.7	254.4	235.2			
48	118	275.8	260.1	241.0			
46	115	281.9	265.7	246.5	226.7		
44	111	287.9	271.6	252.0	231.1		
42	108	292.3	277.9	257.4	235.4	218.6	
40	104	296.6	283.9	262.6	239.8	222.3	
38	100	300.9	288.9	267.7	243.9	225.7	208.8
36	97	304.9	293.8	272.7	248.1	229.2	212.0
34	93	308.9	298.7	276.8	252.2	232.6	215.1
32	90	309.0	303.1	280.8	256.0	236.1	218.3
30	86	309.0	306.4	284.7	259.8	239.8	221.4
28	82	309.1	307.4	288.4	263.5	243.4	224.7
26	79	309.2	307.5	291.5	266.9	247.0	228.1
24	75	309.2	307.5	292.7	270.0	250.4	231.0
22	72	309.3	307.6	292.8	272.5	252.5	232.9
20	68	309.3	307.6	292.8	273.5	253.6	234.4
18	64	309.4	307.7	292.9	273.6	254.7	236.1
16	61	309.4	307.7	292.9	273.6	255.2	237.8
14	57	309.4	307.8	293.0	273.7	255.2	239.1
12	54	309.4	307.8	293.0	273.7	255.3	239.5
10	50	309.5	307.9	293.1	273.7	255.3	239.6
-40	-40	310.6	309.3	294.4	275.0	256.4	240.6

Based on engine bleed for 2 packs on, engine anti-ice on or off and wing anti-ice off.
With engine bleed for packs off, increase weight by 950 kg.
With engine and wing anti-ice on, decrease weight by 1450 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 20450 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
	0	17.1	18.9	21.1	25.8	28.8	32.4	35.9	40.3	45.6	47.3	53.3	60.4	59.6	67.3	76.3	72.3	81.5	92.0
	10	17.7	19.5	21.8	26.6	29.7	33.5	37.1	41.7	47.1	48.8	55.0	62.4	61.6	69.5	78.7	74.6	84.0	94.8
	15	18.0	19.9	22.2	27.1	30.3	34.0	37.8	42.4	47.9	49.7	56.0	63.4	62.7	70.7	80.0	75.9	85.4	96.4
300	20	18.3	20.2	22.5	27.6	30.8	34.6	38.4	43.1	48.8	50.5	57.0	64.5	63.7	71.9	81.3	77.1	86.7	97.8
	30	18.7	20.7	23.1	28.3	31.6	35.6	39.5	44.4	50.2	52.0	58.6	66.4	65.6	73.9	83.6	79.3	89.1	100.
	40	19.0	21.0	23.5	28.8	32.2	36.3	40.3	45.3	51.3	53.2	60.0	68.0	67.2	75.7	85.6	81.2	91.2	103.
	0	16.2	17.9	19.9	24.4	27.2	30.5	33.9	38.0	42.9	44.5	50.1	56.8	56.1	63.3	71.8	68.2	76.9	87.1
	10	16.7	18.4	20.5	25.1	28.0	31.5	35.0	39.2	44.3	46.0	51.8	58.7	58.0	65.4	74.1	70.4	79.3	89.7
	15	17.0	18.8	20.9	25.6	28.5	32.1	35.6	39.9	45.1	46.8	52.7	59.7	59.0	66.6	75.4	71.6	80.6	91.1
	20	17.3	19.1	21.3	26.0	29.0	32.6	36.2	40.6	45.9	47.6	53.6	60.7	60.0	67.7	76.6	72.7	81.9	92.4
280	30	17.7	19.6	21.8	26.7	29.8	33.5	37.2	41.8	47.2	49.0	55.2	62.5	61.7	69.6	78.8	74.9	84.2	94.9
	40	18.0	19.8	22.2	27.2	30.4	34.2	38.0	42.7	48.3	50.1	56.4	64.0	63.2	71.3	80.7	76.7	86.2	97.2
	0	15.3	16.8	18.8	22.9	25.5	28.6	31.8	35.6	40.2	41.7	46.9	53.1	52.5	59.3	67.2	63.9	72.1	81.7
	10	15.8	17.4	19.3	23.7	26.3	29.6	32.8	36.8	41.5	43.1	48.5	54.9	54.3	61.2	69.4	66.0	74.4	84.2
	15	16.1	17.7	19.7	24.1	26.8	30.1	33.4	37.5	42.2	43.9	49.4	55.9	55.3	62.3	70.6	67.1	75.7	85.6
	20	16.3	18.0	20.0	24.5	27.2	30.6	34.0	38.1	43.0	44.6	50.2	56.8	56.2	63.3	71.7	68.2	76.9	86.9
	30	16.7	18.4	20.5	25.1	28.0	31.4	34.9	39.1	44.2	45.9	51.6	58.5	57.8	65.2	73.8	70.2	79.1	89.3
260	40	16.9	18.7	20.8	25.6	28.5	32.0	35.6	40.0	45.2	46.9	52.8	59.8	59.2	66.8	75.6	71.9	81.0	91.4
	0	14.4	15.8	17.6	21.5	23.9	26.8	29.7	33.2	37.4	38.9	43.7	49.4	48.9	55.1	62.5	59.5	67.1	76.1
	10	14.8	16.3	18.1	22.1	24.6	27.6	30.6	34.3	38.7	40.1	45.1	51.1	50.5	56.9	64.5	61.4	69.3	78.5
	15	15.1	16.6	18.4	22.5	25.1	28.1	31.2	34.9	39.3	40.8	45.9	52.0	51.4	57.9	65.6	62.5	70.5	79.8
	20	15.3	16.8	18.7	22.9	25.5	28.6	31.7	35.5	40.0	41.5	46.7	52.9	52.3	58.9	66.7	63.6	71.7	81.1
	30	15.7	17.3	19.2	23.5	26.2	29.4	32.6	36.5	41.2	42.7	48.1	54.4	53.8	60.7	68.7	65.4	73.8	83.4
	40	15.9	17.5	19.5	23.9	26.6	29.9	33.2	37.2	42.0	43.6	49.1	55.7	55.0	62.1	70.3	67.0	75.5	85.4
240	0	13.5	14.8	16.4	20.0	22.2	24.9	27.6	30.8	34.7	36.0	40.4	45.7	45.2	50.9	57.6	54.9	62.0	70.3
	10	13.9	15.2	16.9	20.6	22.9	25.6	28.4	31.8	35.8	37.1	41.7	47.2	46.6	52.6	59.6	56.7	64.0	72.6
	15	14.1	15.5	17.2	21.0	23.3	26.1	28.9	32.4	36.4	37.8	42.5	48.0	47.5	53.5	60.6	57.7	65.1	73.8
	20	14.3	15.8	17.5	21.4	23.7	26.5	29.4	32.9	37.1	38.5	43.2	48.8	48.3	54.4	61.6	58.7	66.2	75.0
	30	14.7	16.1	17.9	21.9	24.3	27.3	30.3	33.8	38.1	39.6	44.4	50.3	49.7	56.0	63.4	60.5	68.2	77.2
	40	14.9	16.3	18.2	22.3	24.7	27.7	30.8	34.5	38.9	40.4	45.4	51.4	50.8	57.3	64.9	61.9	69.8	79.0
	0	12.6	13.8	15.2	18.6	20.5	23.0	25.4	28.4	31.9	33.1	37.1	41.9	41.4	46.6	52.7	50.2	56.7	64.3
200	10	12.9	14.2	15.7	19.1	21.2	23.7	26.2	29.3	32.9	34.1	38.3	43.2	42.7	48.1	54.5	51.9	58.5	66.4
	15	13.2	14.5	16.0	19.5	21.6	24.1	26.7	29.8	33.5	34.7	39.0	44.0	43.5	49.0	55.4	52.8	59.6	67.5
	20	13.4	14.7	16.2	19.8	21.9	24.5	27.2	30.3	34.1	35.3	39.6	44.8	44.2	49.8	56.4	53.7	60.6	68.6
	30	13.7	15.0	16.6	20.3	22.5	25.2	27.9	31.1	35.0	36.3	40.8	46.1	45.5	51.2	58.0	55.3	62.4	70.6
	40	13.8	15.2	16.9	20.6	22.8	25.6	28.4	31.7	35.7	37.1	41.6	47.1	46.5	52.4	59.4	56.6	63.8	72.3
	0	11.7	12.7	14.1	17.1	18.9	21.1	23.3	25.9	29.1	30.1	33.7	38.0	37.5	42.2	47.7	45.4	51.2	58.0
	10	12.0	13.1	14.5	17.6	19.5	21.7	24.0	26.7	30.0	31.1	34.8	39.2	38.7	43.5	49.3	46.9	52.9	59.9
180	15	12.2	13.4	14.8	17.9	19.8	22.1	24.4	27.2	30.5	31.7	35.4	39.9	39.4	44.3	50.1	47.8	53.8	60.9
	20	12.4	13.6	15.0	18.2	20.1	22.5	24.8	27.6	31.1	32.2	36.0	40.6	40.1	45.1	51.0	48.6	54.7	62.0
	30	12.7	13.9	15.4	18.7	20.6	23.1	25.5	28.4	31.9	33.1	37.0	41.8	41.3	46.4	52.5	50.0	56.3	63.8
	40	12.8	14.0	15.6	18.9	21.0	23.4	25.9	28.9	32.5	33.7	37.8	42.7	42.1	47.4	53.7	51.1	57.6	65.3

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.**
If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100
LANDING	MAX MAN	7.0	16.1	25.2	34.4	43.5	52.7	62.0	71.3	80.8	90.4
	MAX AUTO	6.8	14.9	23.1	31.6	40.3	49.3	58.5	68.1	77.9	88.0
	AUTOBRAKE 4	6.6	14.0	21.5	29.3	37.3	45.7	54.4	63.5	73.0	83.1
	AUTOBRAKE 3	6.2	13.0	19.9	27.0	34.4	42.0	49.9	58.3	67.1	76.4
	AUTOBRAKE 2	5.9	12.1	18.4	24.9	31.5	38.4	45.6	53.1	61.1	69.5
	AUTOBRAKE 1	5.7	11.3	17.0	22.8	28.9	35.2	41.7	48.6	55.8	63.4

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100
LANDING	MAX MAN	6.3	15.1	23.8	32.3	40.7	49.1	57.5	66.0	74.5	83.2
	MAX AUTO	4.9	12.0	19.2	26.6	34.3	42.2	50.5	59.1	68.1	77.5
	AUTOBRAKE 4	4.0	9.4	15.1	21.2	27.6	34.4	41.7	49.5	57.9	66.8
	AUTOBRAKE 3	2.7	6.7	11.1	15.9	21.1	26.6	32.6	39.1	46.1	53.5
	AUTOBRAKE 2	1.5	4.4	7.7	11.3	15.2	19.5	24.2	29.2	34.7	40.5
	AUTOBRAKE 1	1.0	3.0	5.3	7.8	10.6	13.8	17.4	21.3	25.7	30.6

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE REQUIRED	1	1	2	4	5	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	13	23	40	53	66	73		
BTMS	UP TO 2.4	2.4	2.5	2.9	3.4	4.0	4.4	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (Inflight gear extended, the BTMS indications may vary between individual brakes, due to airstream effects, gear tilt, and position of the gear temperature probes.)

Performance Inflight — Chapter PI
Engine Inoperative — Section 33

ENGINE INOP

Initial Max Continuous EPR
Based on .84M, engine bleed for one pack on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20 & ABOVE	1.243	1.234	1.226	1.211	1.192	1.183	1.181	1.175	1.170
15	1.284	1.275	1.263	1.250	1.232	1.222	1.220	1.216	1.212
10	1.327	1.319	1.307	1.288	1.273	1.264	1.262	1.259	1.257
5	1.364	1.366	1.354	1.337	1.314	1.306	1.304	1.302	1.300
0	1.364	1.402	1.406	1.388	1.368	1.355	1.354	1.351	1.349
-5	1.364	1.402	1.439	1.444	1.424	1.412	1.411	1.408	1.406
-10	1.364	1.402	1.439	1.473	1.482	1.471	1.469	1.467	1.465
-15	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518
-20 & BELOW	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off
37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	.63	1.531	1.531	1.531	1.531	1.531	1.489	1.436	1.385	1.341	1.302	1.263	1.233
240	.74	1.534	1.534	1.534	1.534	1.534	1.534	1.517	1.455	1.402	1.349	1.308	1.268
280	.86	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.469	1.413	1.356	1.304

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	.60	1.517	1.517	1.517	1.517	1.517	1.486	1.433	1.385	1.341	1.304	1.267	1.234
240	.71	1.514	1.514	1.514	1.514	1.514	1.514	1.502	1.444	1.394	1.344	1.305	1.266
280	.82	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.476	1.417	1.362	1.311

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	.58	1.499	1.499	1.499	1.499	1.499	1.499	1.447	1.401	1.358	1.323	1.290	1.257
240	.68	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.452	1.402	1.355	1.314	1.278
280	.79	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.472	1.414	1.363	1.314
320	.89	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.389	1.338

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	.55	1.480	1.480	1.480	1.480	1.480	1.461	1.414	1.372	1.332	1.303	1.274	1.245
240	.66	1.471	1.471	1.471	1.471	1.471	1.471	1.461	1.410	1.365	1.322	1.291	1.260
280	.76	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.415	1.366	1.321	1.281
320	.85	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.406	1.353	1.306

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	.53	1.493	1.493	1.493	1.493	1.493	1.454	1.411	1.369	1.334	1.302	1.270	1.252
240	.63	1.475	1.475	1.475	1.475	1.475	1.475	1.441	1.395	1.352	1.315	1.286	1.255
280	.73	1.446	1.446	1.446	1.446	1.446	1.446	1.446	1.426	1.378	1.334	1.293	1.259
320	.82	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.362	1.317	1.273
360	.91	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.330	1.284

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	.51	1.507	1.507	1.507	1.507	1.507	1.499	1.452	1.409	1.368	1.336	1.302	1.268
240	.60	1.488	1.488	1.488	1.488	1.488	1.488	1.483	1.434	1.391	1.349	1.317	1.286
280	.70	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.398	1.355	1.314	1.279
320	.79	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.368	1.323	1.282
360	.88	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.325	1.281

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE ANTI-ICE ON	-0.004	-0.003	-0.003	-0.003	-0.003	-0.004
ENGINE & WING ANTI-ICE*	-0.015	-0.014	-0.013	-0.012	-0.012	-0.012
ENGINE & WING ANTI-ICE**	-0.026	-0.024	-0.022	-0.021	-0.020	-0.019

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	.49	1.521	1.521	1.521	1.521	1.521	1.496	1.450	1.407	1.369	1.337	1.303	1.278
240	.58	1.502	1.502	1.502	1.502	1.502	1.502	1.477	1.431	1.389	1.350	1.316	1.282
280	.67	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.430	1.384	1.344	1.305	1.273
320	.76	1.386	1.389	1.389	1.389	1.389	1.389	1.389	1.389	1.380	1.335	1.296	1.257
360	.85	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.288	1.249
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	.48	1.523	1.523	1.523	1.523	1.523	1.512	1.465	1.420	1.379	1.346	1.312	1.278
240	.57	1.502	1.502	1.502	1.502	1.502	1.502	1.490	1.443	1.399	1.357	1.324	1.289
280	.66	1.455	1.455	1.455	1.455	1.455	1.455	1.455	1.447	1.400	1.358	1.316	1.283
320	.75	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.350	1.309	1.269
360	.83	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.300	1.259
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	.46	1.523	1.523	1.523	1.523	1.523	1.496	1.449	1.404	1.364	1.330	1.295	1.271
240	.55	1.505	1.505	1.505	1.505	1.505	1.505	1.473	1.426	1.380	1.341	1.307	1.273
280	.63	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.433	1.387	1.342	1.302	1.269
320	.72	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.385	1.340	1.297	1.255
360	.80	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.329	1.287	1.246
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	.44	1.519	1.519	1.519	1.519	1.519	1.519	1.477	1.429	1.383	1.346	1.311	1.275
240	.53	1.512	1.512	1.512	1.512	1.512	1.512	1.509	1.461	1.413	1.366	1.329	1.294
280	.61	1.469	1.469	1.469	1.469	1.469	1.469	1.469	1.465	1.417	1.368	1.321	1.287
320	.69	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.376	1.329	1.283
360	.77	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.317	1.274
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	.42	1.511	1.511	1.511	1.511	1.511	1.500	1.455	1.411	1.369	1.337	1.305	1.275
240	.51	1.515	1.515	1.515	1.515	1.515	1.515	1.495	1.449	1.403	1.362	1.328	1.293
280	.59	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.447	1.400	1.354	1.313	1.282
320	.67	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.402	1.356	1.311	1.269
360	.75	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.349	1.305	1.262

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE ANTI-ICE ON	-0.005	-0.006	-0.007	-0.006	-0.010
ENGINE & WING ANTI-ICE*	-0.012	-0.012	-0.013	-0.012	-0.015
ENGINE & WING ANTI-ICE**	-0.019	-0.019	-0.019	-0.018	-0.020

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	.41	1.504	1.504	1.504	1.504	1.504	1.504	1.479	1.438	1.396	1.360	1.332	1.304
240	.49	1.511	1.511	1.511	1.511	1.511	1.511	1.511	1.477	1.432	1.389	1.354	1.322
280	.57	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.432	1.387	1.344	1.310
320	.64	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.384	1.340	1.296
360	.72	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.337	1.294

14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
200	.39	1.488	1.488	1.488	1.488	1.488	1.488	1.452	1.413	1.373	1.343	1.315	1.288
240	.47	1.491	1.491	1.491	1.491	1.491	1.491	1.484	1.444	1.402	1.361	1.330	1.298
280	.54	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.449	1.407	1.365	1.324	1.293
320	.62	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.400	1.357	1.315	1.275
360	.69	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.354	1.313	1.272

12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	.38	1.475	1.475	1.475	1.475	1.475	1.468	1.431	1.393	1.355	1.329	1.302	1.276
240	.45	1.473	1.473	1.473	1.473	1.473	1.473	1.453	1.415	1.375	1.339	1.308	1.277
280	.52	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.424	1.385	1.344	1.308	1.275
320	.60	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.373	1.333	1.292	1.257
360	.67	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.327	1.288	1.248

10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	.36	1.462	1.462	1.462	1.462	1.462	1.462	1.444	1.408	1.371	1.338	1.311	1.284
240	.43	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.421	1.383	1.345	1.313	1.283
280	.51	1.438	1.438	1.438	1.438	1.438	1.438	1.438	1.433	1.397	1.358	1.318	1.286
320	.58	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.382	1.344	1.305	1.265
360	.65	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.332	1.295	1.258

5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
200	.33	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.399	1.367	1.334	1.306	1.282
240	.40	1.400	1.400	1.400	1.400	1.400	1.400	1.400	1.394	1.361	1.328	1.295	1.269
280	.46	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.365	1.330	1.295	1.263
320	.53	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.323	1.288	1.253
360	.59	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.270	1.237

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE ANTI-ICE ON	-0.013	-0.015	-0.015	-0.015	-0.010
ENGINE & WING ANTI-ICE*	-0.018	-0.019	-0.019	-0.018	-0.012
ENGINE & WING ANTI-ICE**	-0.024	-0.024	-0.023	-0.022	-0.014

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	17000	15600	13900
280	271	273	18800	17500	15900
260	252	263	20700	19400	17900
240	232	253	22600	21400	19900
220	213	243	24700	23400	22000
200	194	232	26600	25500	24300
180	174	220	28700	27500	26400
160	154	208	31000	29700	28600

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
133	125	117	111	105	100	95	91	87	84	80
272	254	238	224	211	200	190	181	173	165	158
410	382	358	336	317	300	285	271	258	247	236
547	510	477	448	423	400	380	361	344	329	315
683	637	596	560	528	500	475	452	431	412	394
818	763	714	672	634	600	570	542	517	495	474
952	888	832	783	739	700	665	633	604	578	554
1085	1013	950	894	844	800	760	724	691	661	634
1218	1138	1067	1005	950	900	855	815	778	745	714
1350	1262	1184	1116	1055	1000	951	906	865	828	794
1482	1386	1301	1227	1160	1100	1046	997	953	912	874
1614	1510	1418	1337	1265	1200	1141	1088	1040	996	955
1746	1634	1536	1448	1370	1300	1237	1179	1127	1079	1035
1879	1759	1653	1559	1475	1400	1332	1270	1214	1163	1116
2011	1883	1770	1670	1580	1500	1427	1362	1301	1246	1196
2145	2008	1888	1781	1686	1600	1523	1452	1388	1330	1276
2278	2133	2006	1892	1791	1700	1618	1543	1475	1413	1356
2413	2259	2124	2004	1896	1800	1713	1634	1562	1496	1435

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	160	180	200	220	240	260	280	300	
100	0.9	1.0	1.1	1.1	1.3	1.3	1.5	1.5	0:15
200	2.1	2.2	2.5	2.7	3.0	3.1	3.4	3.5	0:32
300	3.4	3.7	4.1	4.4	4.9	5.1	5.6	5.9	0:48
400	4.8	5.2	5.8	6.3	6.9	7.3	7.9	8.3	1:05
500	6.1	6.7	7.4	8.0	8.8	9.4	10.1	10.7	1:20
600	7.4	8.1	9.0	9.7	10.6	11.3	12.2	12.9	1:36
700	8.7	9.5	10.5	11.4	12.4	13.3	14.3	15.2	1:51
800	9.9	10.9	12.0	13.0	14.2	15.2	16.4	17.4	2:06
900	11.2	12.3	13.6	14.7	16.0	17.1	18.4	19.6	2:21
1000	12.4	13.7	15.1	16.3	17.8	19.1	20.5	21.7	2:36
1100	13.7	15.0	16.6	18.0	19.6	21.0	22.5	23.9	2:50
1200	14.9	16.4	18.1	19.6	21.3	22.9	24.6	26.1	3:05
1300	16.1	17.8	19.6	21.2	23.1	24.8	26.6	28.3	3:19
1400	17.3	19.1	21.0	22.8	24.9	26.6	28.6	30.4	3:34
1500	18.5	20.4	22.5	24.4	26.6	28.5	30.6	32.5	3:49
1600	19.7	21.8	24.0	26.0	28.3	30.4	32.6	34.7	4:04
1700	20.9	23.1	25.4	27.6	30.0	32.2	34.6	36.8	4:19
1800	22.0	24.4	26.9	29.2	31.7	34.0	36.5	38.9	4:34

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	14000	11800	9200
290	14800	12500	10200
280	15500	13300	10900
270	16000	14100	11600
260	16900	15200	12900
250	18000	16300	14400
240	19100	17500	15700
230	20200	18600	16800
220	21300	19800	18000
210	22400	21000	19200
200	23500	22200	20500
190	24700	23400	21900
180	25900	24700	23300
170	27200	25900	24800
160	28500	27200	26000

With engine anti-ice on, decrease altitude capability by 1000 ft.
With engine and wing anti-ice on, decrease altitude capability by 1400 ft.

320 KIAS Altitude Capability

Max Continuous Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	14400	12200	9900
290	15200	13000	10700
280	15800	13800	11500
270	16400	14600	12200
260	17000	15300	12900
250	17600	15900	13700
240	18200	16500	14400
230	18800	17000	15100
220	19300	17600	15600
210	19800	18100	16100
200	20300	18500	16600
190	20600	19000	17000
180	21000	19400	17400
170	21300	19800	17800
160	21600	20100	18200

With engine anti-ice on, decrease altitude capability by 1000 ft.
With engine and wing anti-ice on, decrease altitude capability by 1300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
300	EPR	1.273	1.385						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	9022	9176						
280	EPR	1.252	1.355	1.409					
	MACH	.585	.641	.665					
	KIAS	325	325	325					
	FF/ENG	8669	8800	8901					
260	EPR	1.228	1.322	1.372					
	MACH	.574	.632	.658					
	KIAS	319	320	322					
	FF/ENG	8132	8318	8412					
240	EPR	1.202	1.283	1.326	1.378				
	MACH	.552	.608	.632	.659				
	KIAS	306	308	308	310				
	FF/ENG	7456	7591	7660	7752				
220	EPR	1.177	1.246	1.283	1.327	1.380			
	MACH	.529	.583	.606	.631	.658			
	KIAS	293	295	295	296	297			
	FF/ENG	6782	6875	6937	6998	7090			
200	EPR	1.154	1.213	1.244	1.281	1.325	1.378		
	MACH	.506	.556	.579	.603	.627	.654		
	KIAS	280	281	282	282	283	284		
	FF/ENG	6138	6161	6224	6280	6339	6422		
180	EPR	1.131	1.182	1.208	1.239	1.274	1.318	1.371	1.438
	MACH	.483	.529	.550	.573	.597	.621	.648	.677
	KIAS	267	266	267	268	268	269	270	271
	FF/ENG	5517	5458	5513	5572	5627	5681	5742	5882
160	EPR	1.109	1.153	1.174	1.200	1.229	1.264	1.306	1.357
	MACH	.459	.500	.520	.540	.563	.587	.612	.639
	KIAS	254	252	252	252	252	253	254	254
	FF/ENG	4921	4822	4826	4859	4921	4975	5017	5064

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
290	266	245	228	213	200	191	182	174	167	161
581	534	492	457	427	400	382	366	351	337	324
873	802	739	686	641	600	574	549	526	506	487
1167	1072	987	916	855	800	765	732	702	675	650
1462	1342	1235	1146	1069	1000	956	916	878	844	813
1758	1612	1484	1376	1283	1200	1148	1099	1054	1013	975
2055	1884	1733	1606	1497	1400	1339	1282	1229	1181	1137
2354	2157	1983	1837	1712	1600	1530	1465	1405	1349	1299
2654	2431	2234	2068	1926	1800	1720	1647	1579	1516	1460

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.5	0:40	3.0	0:38	2.7	0:37	2.4	0:35	2.2	0:34
400	7.3	1:18	6.6	1:14	6.2	1:10	5.7	1:06	5.4	1:03
600	11.1	1:56	10.2	1:50	9.6	1:43	9.0	1:38	8.6	1:32
800	14.9	2:34	13.7	2:25	12.9	2:17	12.2	2:09	11.7	2:01
1000	18.6	3:13	17.2	3:02	16.3	2:51	15.4	2:41	14.8	2:31
1200	22.3	3:51	20.6	3:38	19.6	3:25	18.5	3:13	17.8	3:01
1400	25.9	4:31	24.0	4:15	22.8	4:00	21.7	3:45	20.8	3:31
1600	29.5	5:10	27.4	4:53	26.1	4:35	24.7	4:18	23.8	4:01
1800	33.1	5:50	30.7	5:30	29.2	5:10	27.8	4:51	26.7	4:32

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)			
	150	200	250	300
2	-0.2	0.0	0.2	0.4
4	-0.5	0.0	0.6	1.2
6	-0.7	0.0	1.1	2.0
8	-1.0	0.0	1.5	2.8
10	-1.3	0.0	2.0	3.6
12	-1.6	0.0	2.4	4.4
14	-1.9	0.0	2.9	5.2
16	-2.2	0.0	3.4	6.0
18	-2.4	0.0	3.8	6.8
20	-2.7	0.0	4.3	7.6
22	-3.0	0.0	4.8	8.5
24	-3.3	0.0	5.2	9.3
26	-3.6	0.0	5.7	10.1
28	-3.9	0.0	6.2	10.9
30	-4.1	0.0	6.6	11.7
32	-4.4	0.0	7.1	12.5
34	-4.7	0.0	7.6	13.3

Based on Long Range Cruise and .84/310/250 descent.

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
277	257	240	225	212	200	191	183	175	168	162
552	513	479	449	423	400	383	367	353	339	327
826	769	718	674	635	600	575	551	529	509	491
1101	1025	957	898	847	800	767	736	707	680	656
1376	1282	1197	1123	1059	1000	958	919	883	851	821
1650	1537	1435	1348	1270	1200	1150	1104	1061	1021	985
1925	1793	1675	1572	1482	1400	1342	1288	1238	1192	1150
2199	2049	1914	1797	1693	1600	1534	1472	1415	1363	1315
2474	2305	2153	2021	1905	1800	1726	1657	1593	1533	1479

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.7	0:36	3.2	0:35	2.9	0:34	2.6	0:33	2.4	0:32
400	7.8	1:09	7.1	1:06	6.6	1:03	6.2	1:00	6.1	0:58
600	11.9	1:42	10.9	1:37	10.2	1:32	9.8	1:28	9.7	1:24
800	15.9	2:14	14.8	2:08	13.9	2:01	13.4	1:55	13.3	1:49
1000	19.9	2:47	18.6	2:38	17.5	2:30	16.9	2:22	16.9	2:15
1200	24.0	3:19	22.4	3:09	21.1	2:59	20.4	2:50	20.4	2:41
1400	28.0	3:52	26.2	3:40	24.8	3:28	23.9	3:17	24.0	3:07
1600	31.9	4:25	29.9	4:11	28.3	3:57	27.4	3:45	27.5	3:32
1800	35.9	4:57	33.7	4:41	31.9	4:26	30.9	4:12	31.0	3:58

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Diversion Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	180	200	220	240	260	280	300
2	0.0	0.0	0.0	0.1	0.1	0.2	0.3
4	0.0	0.0	0.1	0.2	0.3	0.5	0.7
6	-0.1	0.0	0.1	0.3	0.6	0.9	1.2
8	-0.2	0.0	0.2	0.5	0.8	1.2	1.7
10	-0.2	0.0	0.3	0.7	1.1	1.6	2.2
12	-0.2	0.0	0.4	0.8	1.4	2.0	2.7
14	-0.3	0.0	0.4	1.0	1.6	2.3	3.2
16	-0.3	0.0	0.5	1.1	1.8	2.7	3.6
18	-0.4	0.0	0.6	1.3	2.1	3.0	4.1
20	-0.4	0.0	0.6	1.4	2.3	3.4	4.6
22	-0.5	0.0	0.7	1.6	2.6	3.7	5.0
24	-0.5	0.0	0.8	1.7	2.8	4.0	5.4
26	-0.5	0.0	0.8	1.8	3.0	4.4	5.9
28	-0.6	0.0	0.9	2.0	3.2	4.7	6.3
30	-0.6	0.0	1.0	2.1	3.5	5.0	6.7
32	-0.6	0.0	1.0	2.3	3.7	5.3	7.1
34	-0.7	0.0	1.1	2.4	3.9	5.6	7.5
36	-0.7	0.0	1.1	2.5	4.1	5.9	7.9
38	-0.8	0.0	1.2	2.6	4.3	6.2	8.3
40	-0.8	0.0	1.3	2.8	4.5	6.5	8.7

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
300	EPR	1.167	1.205	1.277	1.374		
	KIAS	260	260	262	277		
	FF/ENG	8010	8020	8190	8560		
280	EPR	1.152	1.184	1.250	1.338		
	KIAS	251	251	253	261		
	FF/ENG	7450	7440	7560	7810		
260	EPR	1.137	1.165	1.223	1.305	1.422	
	KIAS	242	242	243	246	266	
	FF/ENG	6890	6880	6950	7090	7540	
240	EPR	1.123	1.148	1.198	1.270	1.371	
	KIAS	232	233	234	235	247	
	FF/ENG	6340	6330	6370	6440	6740	
220	EPR	1.107	1.131	1.173	1.237	1.327	1.473
	KIAS	224	224	224	224	230	251
	FF/ENG	5800	5790	5820	5810	6000	6520
200	EPR	1.093	1.113	1.150	1.204	1.283	1.397
	KIAS	217	217	217	217	217	229
	FF/ENG	5290	5270	5290	5230	5340	5630
180	EPR	1.080	1.096	1.128	1.173	1.240	1.338
	KIAS	209	209	209	209	209	209
	FF/ENG	4910	4760	4770	4710	4760	4890
160	EPR	1.068	1.082	1.107	1.145	1.200	1.281
	KIAS	201	201	201	201	201	201
	FF/ENG	4410	4260	4260	4200	4200	4300

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	490	390				
50	540	440	300			
48	590	480	350			
46	640	530	400	240		
44	680	580	440	280		
42	720	630	490	310	170	
40	750	680	530	350	200	
38	790	720	570	380	230	90
36	820	750	600	410	260	120
34	860	790	630	450	290	150
32	860	830	670	480	320	170
30	860	860	700	510	350	200
20	880	880	770	630	470	310
10	900	890	780	640	490	360
0	910	910	800	650	500	370
-20	950	950	830	680	520	390
-40	990	990	870	710	540	400

Rate of climb capability shown is valid for 200000 kg, gear down at VREF20 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.
Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-10	-110				
50	30	-70	-210			
48	70	-30	-160			
46	120	10	-120	-270		
44	160	60	-80	-240		
42	190	100	-40	-210	-350	
40	220	150	-10	-180	-320	
38	250	180	30	-150	-290	-440
36	280	210	60	-120	-270	-410
34	310	240	90	-100	-240	-390
32	310	270	120	-70	-220	-370
30	310	300	140	-40	-190	-340
20	320	310	200	60	-100	-250
10	330	320	200	60	-90	-220
0	330	320	200	60	-90	-220
-20	350	340	210	60	-90	-230
-40	360	360	220	70	-90	-240

Rate of climb capability shown is valid for 200000 kg, gear down at VREF30 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.
Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Intentionally
Blank

Performance Inflight — Chapter PI
Alternate Mode EEC — Section 34

ALTERNATE MODE EEC

Limit Weight

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 KG)								
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 KG)								
	160	180	200	220	240	260	280	300	320
FIELD	154.6	173.9	193.2	212.6	231.9	251.2	270.5	289.9	309.2
CLIMB	142.7	161.9	181.1	200.4	219.6	238.8	258.1	277.3	296.5
OBSTACLE	149.1	167.3	185.4	203.6	221.8	240.0	258.1	276.3	294.5
NET LEVEL OFF WEIGHT	151.0	168.7	186.4	204.2	221.9	239.6	257.3	275.1	292.8
LANDING CLIMB	140.9	160.4	180.0	199.6	219.1	238.7	258.3	277.9	297.4

Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
V1	+1
VR	+1
V2	0

Max Takeoff %N1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	92.4	92.7	92.9	93.1	93.3	93.4	93.4	93.4	93.3	93.2	93.1
50	122	93.4	93.9	93.9	93.9	93.9	94.0	94.1	94.1	94.0	94.0	93.9
45	113	94.4	95.0	95.0	95.0	94.8	94.7	94.7	94.7	94.7	94.6	94.6
40	104	94.9	96.3	96.1	96.1	95.7	95.4	95.3	95.3	95.3	95.3	95.2
35	95	95.4	96.9	97.0	96.9	96.5	96.1	96.1	96.0	96.0	96.0	96.0
30	86	94.9	98.0	97.8	97.8	97.4	97.0	96.9	96.9	96.8	96.8	96.7
25	77	94.1	97.4	97.8	98.2	97.9	97.6	97.8	97.7	97.6	97.6	97.6
20	68	93.3	96.6	97.0	97.4	97.6	97.8	97.7	97.8	97.9	97.8	97.8
15	59	92.5	95.7	96.1	96.6	96.8	96.9	97.2	97.4	97.8	98.0	97.9
10	50	91.7	94.9	95.3	95.7	95.9	96.1	96.3	96.5	96.9	97.3	97.5
5	41	90.9	94.0	94.4	94.9	95.1	95.2	95.5	95.7	96.1	96.5	96.6
0	32	90.1	93.2	93.6	94.0	94.2	94.4	94.6	94.8	95.2	95.6	95.8
-10	14	88.4	91.5	91.9	92.3	92.5	92.6	92.9	93.1	93.5	93.8	94.0
-20	-4	86.7	89.7	90.1	90.5	90.7	90.9	91.1	91.3	91.7	92.0	92.2
-30	-22	85.0	87.9	88.3	88.7	88.9	89.0	89.3	89.5	89.8	90.2	90.3
-40	-40	83.2	86.1	86.5	86.9	87.0	87.2	87.4	87.6	88.0	88.3	88.5
-50	-58	81.4	84.2	84.6	85.0	85.1	85.3	85.5	85.7	86.1	86.4	86.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
PACKS OFF	0.1	0.2	0.2	0.2	0.2	0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3

ALTERNATE MODE EEC

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT) / SPEED (KIAS OR MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
	310	310	310	310	310	310	310	.84	.84	.84
60	83.9	84.6	86.7	89.4	92.2	93.4	94.5	96.1	96.3	96.0
50	85.4	86.2	86.7	88.1	90.8	92.0	93.1	94.7	94.9	94.5
40	86.8	87.5	88.0	88.9	89.8	90.6	91.6	93.2	93.4	93.1
30	85.9	88.8	89.4	90.2	91.0	90.8	90.5	91.7	91.9	91.6
20	84.5	87.3	89.8	91.3	92.1	91.8	91.9	90.9	90.3	90.0
15	83.7	86.6	89.1	91.7	92.6	92.5	92.3	91.5	91.1	90.9
10	83.0	85.8	88.3	90.9	93.2	93.1	92.9	92.1	91.7	91.5
5	82.3	85.1	87.5	90.1	92.8	93.9	93.6	92.5	92.2	92.1
0	81.5	84.3	86.7	89.3	92.0	93.9	94.5	93.3	92.8	92.7
-5	80.8	83.5	85.9	88.5	91.1	93.0	94.6	94.3	93.8	93.7
-10	80.0	82.7	85.1	87.7	90.3	92.1	93.7	95.4	94.9	94.8
-15	79.3	81.9	84.3	86.8	89.4	91.2	92.9	95.4	96.0	95.9
-20	78.5	81.1	83.5	86.0	88.5	90.4	91.9	94.5	95.0	94.9
-25	77.7	80.3	82.7	85.1	87.7	89.5	91.0	93.5	94.1	94.0
-30	76.9	79.5	81.8	84.3	86.8	88.5	90.1	92.6	93.1	93.0
-35	76.1	78.7	81.0	83.4	85.9	87.6	89.2	91.6	92.2	92.1
-40	75.3	77.9	80.1	82.5	85.0	86.7	88.2	90.7	91.2	91.1

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.4	-0.5	-0.7	-0.6	-0.3	-0.2	-.01	-0.1	-0.1	-0.2
ENGINE & WING ANTI-ICE ON	-0.5	-0.6	-0.8	-0.8	-0.5	-0.5	-0.4	-0.5	-0.6	-0.7

Max Cruise %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	89.6	89.4	89.5	89.9	89.2	89.3	89.6	89.5	89.3	89.1
20	90.1	90.0	90.1	90.4	89.9	89.2	88.9	88.8	88.6	88.4
15	90.7	90.5	90.6	90.9	90.5	89.9	89.5	89.5	89.3	89.2
10	91.1	91.0	91.1	91.4	90.9	90.4	90.1	90.1	90.0	89.9
5	91.7	91.5	91.6	91.9	91.4	90.8	90.6	90.5	90.5	90.4
0	91.5	91.9	92.2	92.5	92.0	91.4	91.1	91.0	91.0	90.9
-5	90.7	91.1	91.8	92.6	92.7	92.1	91.8	91.7	91.7	91.6
-10	89.8	90.2	91.0	91.7	92.6	92.9	92.6	92.5	92.5	92.4
-15	89.0	89.4	90.1	90.8	91.7	92.7	93.2	93.1	93.1	93.0
-20	88.1	88.5	89.2	89.9	90.8	91.8	92.2	92.2	92.2	92.1
-25	87.2	87.6	88.3	89.0	89.9	90.9	91.3	91.3	91.3	91.2
-30	86.3	86.7	87.5	88.1	89.0	89.9	90.4	90.4	90.3	90.3
-35	85.4	85.8	86.5	87.2	88.1	89.0	89.5	89.4	89.4	89.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)				
	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING ANTI-ICE ON	-0.4	-0.4	-0.5	-0.5	-0.6

ALTERNATE MODE EEC

Go-Around %N1

Based on engine bleed for packs on, engine anti-ice on or off, wing anti-ice off

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	93.4	93.9	93.9	93.8	94.0	94.2	94.3	94.3	94.3	94.2	94.1	94.1
46	115	50	94.4	95.0	95.1	95.1	94.9	94.8	94.9	95.0	94.9	94.9	94.9	94.8
41	106	45	95.1	96.2	96.1	96.1	95.8	95.6	95.6	95.6	95.5	95.5	95.5	95.5
36	97	40	95.5	97.0	97.0	96.9	93.6	96.2	96.2	96.2	96.1	96.1	96.0	96.0
31	88	35	95.3	97.7	97.7	97.7	97.3	97.0	96.9	96.9	96.8	96.8	96.8	96.7
26	79	30	94.6	97.3	98.0	98.4	98.0	97.7	97.7	97.6	97.6	97.6	97.5	97.5
21	70	25	93.8	96.5	97.2	97.8	98.1	98.3	98.1	98.2	98.2	98.1	98.0	98.0
17	62	20	93.0	95.7	96.4	97.0	97.2	97.5	97.8	98.0	98.3	98.3	98.1	97.9
12	53	15	92.2	94.9	95.5	96.1	96.4	96.7	96.9	97.1	97.6	98.0	98.3	98.3
7	45	10	91.4	94.0	94.7	95.3	95.6	95.9	96.1	96.3	96.7	97.1	97.5	97.9
2	36	5	90.6	93.2	93.9	94.4	94.7	95.0	95.2	95.4	95.9	96.3	96.6	97.0
-3	27	0	89.8	92.4	93.0	93.6	93.9	94.1	94.4	94.6	95.0	95.4	95.8	96.1
-13	9	-10	88.1	90.7	91.3	91.9	92.1	92.4	92.6	92.8	93.3	93.6	94.0	94.3
-23	-9	-20	86.4	88.9	89.5	90.1	90.4	90.6	90.8	91.0	91.5	91.8	92.2	92.5
-33	-27	-30	84.7	87.1	87.8	88.3	88.6	88.8	89.0	89.2	89.6	90.0	90.3	90.7
-43	-45	-40	82.9	85.3	85.9	86.5	86.7	87.0	87.2	87.4	87.8	88.1	88.5	88.8
-53	-63	-50	81.1	83.5	84.1	84.6	84.8	85.1	85.3	85.5	85.9	86.2	86.5	86.9

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.1	0.1	0.2	0.2	0.2	0.2	0.2
1 PACK ON	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3

Intentionally
Blank

ALTERNATE MODE EEC
ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for one pack on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	92.7	92.4	92.1	91.6	90.9	90.5	90.5	90.2	90.0
15	93.2	92.9	92.5	92.1	91.5	91.2	91.1	91.0	90.9
10	93.7	93.5	93.1	92.5	92.1	91.8	91.7	91.6	91.5
5	94.1	94.1	93.7	93.2	92.5	92.3	92.2	92.1	92.1
0	93.2	94.4	94.6	94.0	93.3	92.9	92.9	92.8	92.8
-5	92.4	93.6	94.8	94.9	94.3	93.9	93.9	93.8	93.7
-10	91.5	92.7	93.9	95.1	95.4	95.0	95.0	94.9	94.8
-15	90.6	91.8	93.0	94.2	95.4	96.0	96.0	95.9	95.9
-20	89.7	90.9	92.1	93.3	94.5	95.1	95.1	95.0	94.9
-25	88.9	90.0	91.2	92.3	93.6	94.1	94.1	94.1	94.0
-30	88.0	89.1	90.3	91.4	92.6	93.2	93.2	93.1	93.0
-35	87.0	88.2	89.3	90.5	91.6	92.2	92.2	92.1	92.1
-40	86.1	87.2	88.4	89.5	90.7	91.3	91.2	91.2	91.1

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
ENGINE & WING*	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.6	-0.6	-0.7
ENGINE & WING**	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1	-1.2

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for one pack on or off and anti-ice off

320 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.6	94.2	94.1	93.7	93.4	92.7	92.1	91.6	91.2	91.1	90.9	91.0	91.0	90.5	90.8	91.9
25	92.9	95.0	95.0	94.6	94.3	93.5	92.9	92.2	91.7	91.6	91.6	91.7	91.7	91.3	91.5	92.3
20	92.1	94.6	95.6	95.6	95.3	94.5	93.8	93.0	92.3	92.1	92.0	92.2	92.2	91.8	92.0	92.7
15	91.3	93.8	94.8	95.5	96.3	95.6	94.9	93.8	93.0	92.7	92.6	92.7	92.7	92.3	92.5	93.2
10	90.5	93.0	94.0	94.7	95.5	95.7	96.0	94.8	93.7	93.3	93.2	93.3	93.2	92.9	93.0	93.8
5	89.7	92.2	93.1	93.9	94.6	94.9	95.1	94.8	94.5	94.1	94.0	94.0	93.8	93.5	93.7	94.6
0	88.9	91.3	92.3	93.0	93.8	94.0	94.3	93.9	93.6	93.5	94.1	94.8	94.6	94.3	94.5	95.4
-5	88.1	90.5	91.4	92.2	92.9	93.1	93.4	93.1	92.8	92.7	93.2	93.9	94.4	94.7	95.5	95.9
-10	87.2	89.6	90.6	91.3	92.0	92.3	92.5	92.2	91.9	91.8	92.3	93.0	93.5	93.8	94.6	95.0
-15	86.4	88.8	89.7	90.4	91.2	91.4	91.7	91.3	91.0	90.9	91.4	92.2	92.6	92.9	93.7	94.1
-20	85.6	87.9	88.8	89.6	90.3	90.5	90.8	90.4	90.1	90.0	90.6	91.3	91.7	92.0	92.8	93.2
-25	84.7	87.1	88.0	88.7	89.4	89.6	89.9	89.5	89.2	89.1	89.7	90.4	90.8	91.1	91.9	92.2
-30	83.9	86.2	87.1	87.8	88.5	88.7	89.0	88.6	88.3	88.2	88.7	89.4	89.9	90.2	91.0	91.3
-35	83.0	85.3	86.2	86.9	87.6	87.8	88.0	87.7	87.4	87.3	87.8	88.5	89.0	89.2	90.0	90.4
-40	82.1	84.4	85.3	85.9	86.6	86.8	87.1	86.8	86.5	86.4	86.9	87.6	88.0	88.3	89.1	89.4

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.6	-0.6	-0.6	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.8	-0.8	-0.8	-0.6	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.4
ENGINE & WING**	-0.6	-0.9	-1.0	-1.0	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for one pack on or off and anti-ice off

280 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.2	93.6	93.4	92.9	92.6	91.8	91.1	90.7	90.3	90.1	89.9	90.0	90.4	91.1	91.8	91.8
25	93.2	94.5	94.3	93.8	93.2	92.3	91.7	91.4	91.1	90.8	90.1	89.6	89.6	90.3	91.1	91.0
20	92.4	95.4	95.3	94.8	94.3	93.2	92.2	91.9	91.5	91.4	90.8	90.3	90.2	90.4	90.5	90.6
15	91.7	94.8	95.8	95.9	95.5	94.3	93.3	92.6	92.0	91.8	91.2	90.9	90.8	91.0	91.2	91.3
10	90.9	94.0	94.9	95.8	96.6	95.6	94.6	93.6	92.8	92.5	91.8	91.3	91.3	91.6	91.8	91.9
5	90.0	93.1	94.1	94.9	95.7	95.8	95.8	94.8	93.7	93.3	92.5	92.0	91.9	92.1	92.3	92.3
0	89.2	92.3	93.3	94.1	94.8	95.0	95.2	95.2	94.9	94.3	93.4	92.9	92.7	92.9	93.1	93.0
-5	88.4	91.4	92.4	93.2	94.0	94.1	94.3	94.4	94.4	94.3	94.4	93.9	93.7	93.9	94.1	94.0
-10	87.6	90.6	91.5	92.3	93.1	93.2	93.4	93.5	93.5	93.4	93.5	93.8	94.5	95.0	95.2	95.0
-15	86.8	89.7	90.7	91.5	92.2	92.3	92.5	92.6	92.6	92.5	92.6	92.9	93.6	94.7	95.8	95.5
-20	85.9	88.8	89.8	90.6	91.3	91.4	91.6	91.7	91.7	91.6	91.7	92.0	92.7	93.8	94.9	94.5
-25	85.1	88.0	88.9	89.7	90.4	90.5	90.7	90.8	90.8	90.7	90.8	91.1	91.8	92.8	93.9	93.6
-30	84.2	87.1	88.0	88.8	89.5	89.6	89.8	89.9	89.9	89.8	89.9	90.2	90.8	91.9	93.0	92.6
-35	83.3	86.2	87.1	87.8	88.6	88.7	88.8	88.9	88.9	88.9	89.0	89.3	89.9	91.0	92.0	91.7
-40	82.4	85.3	86.2	86.9	87.6	87.7	87.9	88.0	88.0	87.9	88.0	88.3	89.0	90.0	91.0	90.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4	-0.4	-0.5	-0.5
ENGINE & WING**	-0.6	-1.0	-1.0	-1.1	-1.1	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.7	-0.9	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1
Based on engine bleed for one pack on or off and anti-ice off
240 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	92.1	91.9	91.9	91.8	91.8	90.7	89.4	89.4	90.0	90.4	90.5	90.3	90.9	90.6	91.1	91.6
25	92.8	92.9	92.8	92.4	92.4	91.5	90.4	89.8	89.5	89.6	89.7	89.6	89.6	89.8	90.3	90.8
20	92.3	93.8	93.7	93.4	93.1	92.2	91.2	90.6	90.3	90.1	89.4	88.8	88.8	89.0	89.6	90.0
15	91.5	94.4	94.7	94.5	94.3	93.2	91.9	91.3	90.9	90.8	90.0	89.2	88.5	88.3	88.8	89.3
10	90.7	93.6	94.9	95.6	95.6	94.5	93.1	92.1	91.5	91.4	90.4	89.6	89.1	88.8	88.7	89.1
5	89.9	92.7	94.0	95.1	96.4	95.9	94.6	93.3	92.4	92.1	90.9	89.9	89.5	89.4	89.4	89.8
0	89.1	91.9	93.2	94.3	95.5	96.0	95.9	94.6	93.5	93.1	91.7	90.5	89.8	89.9	90.0	90.4
-5	88.3	91.1	92.3	93.4	94.6	95.1	95.2	95.1	94.7	94.3	92.7	91.4	90.6	90.6	90.6	91.1
-10	87.4	90.2	91.4	92.5	93.7	94.2	94.3	94.3	94.4	94.5	93.9	92.5	91.5	91.6	91.6	92.3
-15	86.6	89.4	90.6	91.7	92.8	93.3	93.4	93.4	93.5	93.6	93.3	93.0	92.8	92.8	92.8	93.4
-20	85.8	88.5	89.7	90.8	91.9	92.4	92.5	92.4	92.6	92.7	92.4	92.1	92.3	93.5	94.1	94.8
-25	84.9	87.6	88.8	89.9	91.0	91.5	91.6	91.5	91.6	91.8.	91.4	91.2	91.4	92.5	93.7	94.6
-30	84.1	86.7	87.9	89.0	90.1	90.5	90.6	90.6	90.7	90.8	90.5	90.3	90.5	91.6	92.7	93.6
-35	83.2	85.8	87.0	88.0	89.2	89.6	89.7	89.7	89.8	89.9	89.6	89.4	89.5	90.6	91.7	92.7
-40	82.3	84.9	86.1	87.7	88.2	88.7	88.8	88.7	88.8	89.0	88.6	88.4	88.6	89.7	90.8	91.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6
ENGINE & WING**	-0.6	-1.0	-1.0	-1.2	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8	-0.9	-0.9	-0.9	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

ALTERNATE MODE EEC
ENGINE INOP

Max Continuous %N1

Based on engine bleed for one pack on or off and anti-ice off
200 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	91.6	90.6	90.3	89.8	89.4	88.2	87.9	88.7	89.3	89.6	89.3	89.2	89.3	89.7	89.9	90.4
25	92.4	91.4	90.9	90.4	90.1	89.1	87.8	87.9	88.6	88.9	88.6	88.5	88.6	89.0	89.1	89.7
20	92.7	92.3	91.8	91.1	90.7	89.9	88.9	88.4	87.9	88.1	87.8	87.7	87.9	88.2	88.4	88.9
15	91.9	93.2	92.7	92.1	91.5	90.5	89.8	89.3	88.8	88.6	87.3	87.0	87.1	87.5	87.6	88.2
10	91.1	93.2	93.6	93.0	92.5	91.6	90.6	90.0	89.5	89.3	88.2	87.1	86.3	86.7	86.8	87.4
5	90.3	92.4	93.2	93.9	93.6	92.7	91.8	90.9	90.1	89.9	88.8	87.8	86.9	86.6	86.1	86.6
0	89.4	91.6	92.3	93.0	93.9	94.0	93.2	92.1	91.1	90.6	89.3	88.3	87.4	87.3	86.8	87.1
-5	88.6	90.7	91.5	92.2	93.1	93.6	94.3	93.5	92.3	91.7	90.2	88.9	87.8	87.8	87.5	87.8
-10	87.8	89.9	90.6	91.3	92.2	92.8	93.4	93.8	93.6	93.0	91.3	89.8	88.5	88.3	88.0	88.4
-15	87.0	89.0	89.7	90.4	91.3	91.9	92.5	92.9	93.2	93.3	92.6	90.8	89.4	89.2	88.9	89.3
-20	86.1	88.1	88.9	89.6	90.4	91.0	91.6	92.0	92.3	92.4	92.1	91.7	90.6	90.3	90.0	90.5
-25	85.3	87.3	88.0	88.7	89.5	90.1	90.7	91.1	91.4	91.5	91.1	90.8	90.5	91.6	91.3	91.8
-30	84.4	86.4	87.1	87.8	88.6	89.2	89.8	90.2	90.4	90.5	90.2	89.9	89.6	90.7	91.7	92.6
-35	83.5	85.5	86.2	86.9	87.7	88.3	88.8	89.2	89.5	89.6	89.3	89.0	88.7	89.7	90.7	91.6
-40	82.6	84.6	85.3	86.0	86.8	87.3	87.9	88.3	88.6	88.7	88.3	88.0	87.8	88.8	89.8	90.6

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.9	-0.7	-0.5	-0.6	-0.5	-0.5	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6
ENGINE & WING**	-0.6	-1.0	-1.0	-1.1	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.9	-0.9	-0.9	-1.0	-1.0	-1.0

***Wing anti-ice on, packs on.**
****Wing anti-ice on, packs off.**

Driftdown Speed/Level Off Altitude - Alt Mode

100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	281	15400	13600	11200
280	271	272	17400	15700	13700
260	251	263	19400	17800	15900
240	232	253	21300	19900	18100
220	213	242	23400	22000	20300
200	194	232	25500	24200	22600
180	174	220	27500	26300	24900
160	155	207	29800	28400	27100

ALTERNATE MODE EEC
ENGINE INOP

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	10900	7900	4000
290	11900	8900	5400
280	12700	9900	6400
270	13500	10700	7600
260	14900	12300	9500
250	16100	13800	11300
240	17200	15200	12900
230	18500	16500	14300
220	19800	17800	15700
210	20900	19100	17000
200	22100	20500	18300
190	23400	21800	19700
180	24600	23100	21200
170	25900	24500	22800
160	27200	25800	24500

GEAR DOWN

220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	1.187	1.185	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
50	1.204	1.199	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
45	1.223	1.219	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
40	1.243	1.239	1.229	1.218	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
35	1.264	1.262	1.253	1.243	1.233	1.223	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
30	1.280	1.286	1.276	1.268	1.259	1.250	1.243	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
25	1.280	1.311	1.303	1.293	1.284	1.276	1.271	1.267	1.259	1.262	1.260	1.251	1.246	1.235	1.225
20	1.280	1.323	1.331	1.321	1.312	1.304	1.299	1.296	1.290	1.280	1.260	1.251	1.246	1.235	1.225
15	1.280	1.323	1.360	1.350	1.342	1.334	1.329	1.326	1.321	1.313	1.293	1.264	1.246	1.235	1.225
10	1.280	1.323	1.366	1.377	1.373	1.366	1.362	1.359	1.352	1.345	1.325	1.295	1.270	1.246	1.225
5	1.280	1.323	1.366	1.377	1.391	1.399	1.396	1.394	1.389	1.380	1.359	1.326	1.298	1.276	1.256
0	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.431	1.426	1.419	1.397	1.359	1.325	1.306	1.292
-5	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.468	1.461	1.439	1.401	1.363	1.337	1.327
-10	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.484	1.444	1.406	1.381	1.369
-15	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.454	1.427	1.417
-20	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.480	1.480	1.469

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003
ENGINE AND WING 1	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013
ENGINE AND WING 2	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.023

Wing 1: Wing anti-ice on, packs on.
Wing 2: Wing anti-ice on, single bleed source and both packs off.

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	12900	10300	6800
290	14400	11900	8900
280	16000	13500	10800
270	17600	15100	12500
260	19200	16800	14300
250	20700	18500	16100
240	22100	20200	17900
230	23500	21700	19700
220	25000	23200	21300
210	25900	24800	22900
200	26900	25800	24500
190	28000	26800	25700
180	29000	27900	26800
170	30200	29000	27800
160	31500	30200	29000

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		10	15	17	19	21	23	25	27	29
300	EPR	1.242								
	MACH	.484								
	KIAS	268								
	FF/ENG	7343								
280	EPR	1.218	1.296	1.338						
	MACH	.470	.512	.531						
	KIAS	260	258	258						
	FF/ENG	6801	6858	6918						
260	EPR	1.195	1.264	1.300	1.344					
	MACH	.455	.496	.514	.533					
	KIAS	251	249	249	249					
	FF/ENG	6293	6307	6337	6396					
240	EPR	1.173	1.235	1.265	1.302	1.347	1.403			
	MACH	.439	.479	.496	.514	.534	.556			
	KIAS	242	241	240	239	239	239			
	FF/ENG	5797	5762	5788	5818	5870	5939			
220	EPR	1.152	1.206	1.233	1.264	1.301	1.347	1.404		
	MACH	.422	.461	.477	.495	.514	.534	.556		
	KIAS	233	232	231	230	230	229	229		
	FF/ENG	5309	5217	5247	5272	5296	5343	5411		
200	EPR	1.132	1.178	1.202	1.229	1.261	1.298	1.343	1.400	
	MACH	.404	.442	.458	.475	.492	.511	.532	.554	
	KIAS	223	222	221	220	220	219	219	219	
	FF/ENG	4820	4725	4712	4732	4763	4776	4819	4879	
180	EPR	1.114	1.152	1.173	1.196	1.224	1.255	1.291	1.337	1.393
	MACH	.385	.421	.437	.453	.470	.489	.509	.531	.553
	KIAS	212	211	211	210	210	209	209	209	209
	FF/ENG	4334	4249	4227	4213	4226	4272	4286	4329	4384
160	EPR	1.096	1.130	1.147	1.166	1.192	1.219	1.249	1.285	1.330
	MACH	.365	.401	.417	.434	.452	.470	.490	.511	.533
	KIAS	201	201	201	201	201	201	201	201	201
	FF/ENG	3859	3799	3792	3781	3778	3798	3848	3860	3896

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
328	293	262	238	217	200	188	177	168	160	153
660	587	525	476	435	400	377	356	337	321	307
995	885	790	715	653	600	566	534	506	481	459
1336	1185	1056	955	872	800	754	712	675	641	612
1680	1488	1324	1196	1091	1000	943	890	843	801	764
2029	1795	1595	1438	1310	1200	1131	1068	1011	960	916
2382	2104	1866	1680	1530	1400	1319	1245	1179	1119	1067
2739	2415	2139	1924	1750	1600	1507	1422	1346	1278	1219
3099	2729	2413	2168	1971	1800	1695	1599	1513	1437	1370
3464	3045	2689	2413	2192	2000	1883	1776	1680	1595	1520
3833	3364	2967	2659	2413	2200	2071	1953	1847	1752	1670
4206	3686	3246	2906	2634	2400	2258	2129	2013	1910	1819
4583	4011	3526	3153	2856	2600	2446	2305	2179	2067	1969
4965	4338	3808	3402	3078	2800	2633	2482	2345	2224	2117
5352	4669	4092	3651	3301	3000	2821	2657	2511	2380	2266
5744	5003	4378	3901	3524	3200	3008	2833	2676	2536	2414
6141	5341	4666	4152	3748	3400	3195	3008	2841	2692	2562
6544	5681	4956	4405	3972	3600	3382	3183	3005	2847	2710
6951	6025	5247	4658	4196	3800	3568	3358	3169	3002	2857
7364	6372	5540	4912	4421	4000	3755	3533	3333	3157	3003

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.5	0:47	6.7	0:45	5.9	0:43	5.4	0:41	5.1	0:40
400	14.4	1:37	13.2	1:32	11.9	1:26	11.1	1:21	10.5	1:17
600	21.3	2:27	19.7	2:19	17.8	2:08	16.8	2:01	15.9	1:55
800	28.2	3:16	26.1	3:06	23.7	2:51	22.4	2:41	21.4	2:32
1000	35.2	4:06	32.6	3:52	29.6	3:33	28.1	3:21	26.8	3:09
1200	41.7	4:58	38.7	4:41	35.2	4:17	33.5	4:02	31.9	3:48
1400	48.3	5:50	44.9	5:29	40.8	5:01	38.9	4:43	37.1	4:26
1600	54.7	6:43	50.9	6:19	46.4	5:45	44.2	5:25	42.1	5:05
1800	60.9	7:36	56.8	7:09	51.9	6:31	49.3	6:07	47.0	5:44
2000	67.2	8:30	62.7	7:59	57.3	7:16	54.4	6:49	51.9	6:23
2200	73.4	9:26	68.3	8:51	62.6	8:02	59.3	7:32	56.6	7:03
2400	79.6	10:22	74.0	9:43	67.8	8:49	64.1	8:15	61.3	7:43
2600	85.6	11:18	79.6	10:35	72.9	9:36	68.9	8:59	65.8	8:24
2800	91.5	12:16	85.0	11:29	77.9	10:24	73.6	9:44	70.3	9:06
3000	97.4	13:14	90.4	12:22	82.9	11:12	78.4	10:28	74.8	9:47
3200	103.1	14:14	95.7	13:18	87.7	12:01	82.9	11:14	79.0	10:29
3400	108.7	15:14	100.9	14:13	92.5	12:50	87.4	11:59	83.3	11:11
3600	114.2	16:15	106.1	15:09	97.1	13:40	91.9	12:46	87.5	11:54
3800	119.5	17:17	111.1	16:06	101.7	14:31	96.2	13:33	91.6	12:38
4000	124.9	18:19	116.2	17:04	106.3	15:22	100.5	14:20	95.7	13:21

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	160	180	200	220	240
10	-1.3	-0.6	0.0	0.9	1.8
20	-2.1	-1.1	0.0	1.7	3.4
30	-2.9	-1.5	0.0	2.4	5.0
40	-3.7	-1.9	0.0	3.1	6.5
50	-4.6	-2.4	0.0	3.8	7.9
60	-5.5	-2.8	0.0	4.5	9.3
70	-6.4	-3.3	0.0	5.1	10.6
80	-7.3	-3.8	0.0	5.7	11.8
90	-8.3	-4.2	0.0	6.3	12.9
100	-9.2	-4.7	0.0	6.8	14.0
110	-10.3	-5.2	0.0	7.3	15.0
120	-11.3	-5.7	0.0	7.7	15.9
130	-12.4	-6.2	0.0	8.2	16.7

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30+80

PRESSURE ALT (1000 FT)	10	15	17	19	21	23	25	27	29
DISTANCE (NM)	20	30	34	38	42	46	50	54	58
TIME (MINUTES)	8	10	10	11	12	13	14	14	15

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
300	EPR	1.138	1.168	1.228	1.313			
	KIAS	249	249	249	249			
	FF/ENG	7060	7040	7110	7250			
280	EPR	1.125	1.152	1.204	1.280			
	KIAS	242	242	242	242			
	FF/ENG	6570	6560	6600	6690			
260	EPR	1.113	1.137	1.183	1.251	1.351		
	KIAS	236	236	236	236	236		
	FF/ENG	6150	6130	6160	6200	6370		
240	EPR	1.101	1.123	1.164	1.224	1.310		
	KIAS	230	230	230	230	230		
	FF/ENG	5740	5720	5740	5710	5850		
220	EPR	1.090	1.110	1.146	1.198	1.274	1.393	
	KIAS	224	224	224	224	224	224	
	FF/ENG	5340	5300	5320	5260	5370	5520	
200	EPR	1.081	1.096	1.129	1.174	1.241	1.339	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4930	4890	4890	4830	4890	5000	
180	EPR	1.071	1.085	1.112	1.151	1.209	1.291	
	KIAS	209	209	209	209	209	209	
	FF/ENG	4640	4470	4470	4410	4400	4500	
160	EPR	1.061	1.074	1.096	1.130	1.178	1.249	1.357
	KIAS	201	201	201	201	201	201	201
	FF/ENG	4230	4170	4050	3990	3970	4040	4120

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding

Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.142	1.172	1.230	1.314	
	KIAS	229	229	229	229	
	FF/ENG	6780	6770	6830	6920	
280	EPR	1.128	1.155	1.207	1.281	
	KIAS	222	222	222	222	
	FF/ENG	6290	6280	6330	6370	
260	EPR	1.115	1.140	1.185	1.251	1.349
	KIAS	216	216	216	216	216
	FF/ENG	5860	5840	5870	5890	6020
240	EPR	1.103	1.125	1.165	1.223	1.308
	KIAS	210	210	210	210	210
	FF/ENG	5440	5410	5440	5410	5510
220	EPR	1.092	1.110	1.146	1.196	1.270
	KIAS	204	204	204	204	204
	FF/ENG	5020	4980	5000	4950	5020
200	EPR	1.081	1.097	1.128	1.171	1.235
	KIAS	197	197	197	197	197
	FF/ENG	4720	4560	4560	4510	4540
180	EPR	1.071	1.085	1.110	1.148	1.201
	KIAS	189	189	189	189	189
	FF/ENG	4300	4250	4130	4080	4070
160	EPR	1.060	1.073	1.094	1.126	1.170
	KIAS	181	181	181	181	181
	FF/ENG	3870	3830	3710	3710	3700

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		VREF 30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
240	228	228	4700	2100	
220	210	222	7700	5700	3100
200	191	215	10600	8800	6600
180	172	207	13400	11800	10000
160	154	199	16200	14800	13000

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
240	1000		
230	3600		
220	5900	3100	
210	7700	5600	2400
200	9300	7200	4900
190	10800	9000	6700
180	12300	10600	8500
170	13800	12200	10300
160	15300	13800	11900

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)					
		5	7	9	11	13	15
220	EPR	1.366	1.411				
	MACH	.372	.385				
	KIAS	225	225				
	FF/ENG	10159	10225				
200	EPR	1.321	1.361	1.407			
	MACH	.359	.372	.386			
	KIAS	217	217	217			
	FF/ENG	9200	9261	9354			
180	EPR	1.282	1.316	1.355	1.401	1.458	
	MACH	.346	.359	.372	.387	.402	
	KIAS	209	209	209	209	209	
	FF/ENG	8353	8379	8430	8508	8617	
160	EPR	1.245	1.274	1.307	1.345	1.391	1.446
	MACH	.333	.345	.358	.372	.386	.401
	KIAS	201	201	201	201	201	201
	FF/ENG	7494	7538	7559	7594	7657	7751

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
342	301	267	240	219	200	187	174	164	155	147
518	455	402	361	328	300	280	261	245	231	220
694	610	538	483	438	400	373	348	327	308	292
871	764	674	604	548	500	466	435	408	384	364
1049	920	810	726	658	600	559	522	489	460	436
1228	1076	947	848	768	700	652	608	570	537	508
1408	1233	1084	970	879	800	744	695	651	612	580
1590	1390	1222	1092	989	900	837	781	731	688	652
1772	1548	1360	1214	1099	1000	930	868	812	764	723
1955	1707	1498	1337	1210	1100	1023	954	893	840	795
2139	1866	1636	1460	1320	1200	1116	1040	974	916	866

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	7.5	0:52	7.2	0:51	6.9	0:50	6.7	0:49	6.5	0:47
300	11.3	1:18	10.9	1:16	10.6	1:14	10.3	1:12	10.1	1:10
400	15.1	1:44	14.7	1:41	14.3	1:39	13.9	1:36	13.7	1:33
500	18.9	2:10	18.4	2:07	17.9	2:03	17.5	2:00	17.2	1:56
600	22.6	2:37	22.0	2:32	21.5	2:28	21.0	2:24	20.7	2:20
700	26.3	3:03	25.6	2:58	25.0	2:53	24.4	2:48	24.1	2:43
800	30.0	3:30	29.2	3:24	28.5	3:18	27.9	3:12	27.5	3:07
900	33.6	3:57	32.7	3:50	31.9	3:43	31.2	3:37	30.7	3:30
1000	37.1	4:24	36.2	4:16	35.3	4:09	34.6	4:01	34.0	3:54
1100	40.6	4:51	39.6	4:43	38.6	4:34	37.8	4:26	37.2	4:18
1200	44.1	5:19	43.0	5:09	42.0	5:00	41.1	4:51	40.4	4:43

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)			
	160	200	240	280
5	-0.5	0.0	0.7	1.4
10	-1.1	0.0	1.6	3.1
15	-1.7	0.0	2.4	4.8
20	-2.4	0.0	3.3	6.4
25	-3.0	0.0	4.1	8.1
30	-3.6	0.0	4.9	9.7
35	-4.2	0.0	5.7	11.4
40	-4.8	0.0	6.4	13.0
45	-5.4	0.0	7.2	14.6

Based on Long Range Cruise and VREF30+80 descent.

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
240	EPR	1.332			
	KIAS	230			
	FF/ENG	11360			
220	EPR	1.298	1.362		
	KIAS	224	224		
	FF/ENG	10480	10580		
200	EPR	1.265	1.321	1.434	
	KIAS	217	217	217	
	FF/ENG	9610	9660	9880	
180	EPR	1.233	1.282	1.377	
	KIAS	209	209	209	
	FF/ENG	8690	8770	8890	
160	EPR	1.203	1.245	1.325	1.446
	KIAS	201	201	201	201
	FF/ENG	7830	7870	7950	8140

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight — Chapter PI
Text — Section 38

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

FMC Takeoff Speeds

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

Dry Snow

Enter the table with the dry snow depth and read the Equivalent Slush/ Standing Water Depth used to enter the Slush/Standing Water table.

Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

(1) Determine the dry field/obstacle limit weight for the takeoff flap setting.

(2) Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.

(3) Adjust field length available for temperature by amount shown on chart.

(4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

(1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.

(2) If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

Slippery Runway

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will

appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

If takeoffs are scheduled using these simplified speeds in conjunction with airport analyses that include clearway and/or stopway credits, adjustments to V1 speed are required.

Adjust V1 by the amount shown in the Clearway/Stopway table. The adjusted V1 must not exceed VR.

The maximum allowable clearway limits shown on the takeoff speeds page are provided for guidance when more precise data is unavailable.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around EPR

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

Max Climb EPR

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average EPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target EPR, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target EPR, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 is based on

VREF30+60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC/320 KIAS speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target EPR, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative for Long Range Cruise and 320 KIAS. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit and the more limiting of the two must be used as the landing limit weight. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

Max Cruise %N1

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Alternate Mode EEC, Engine Inoperative

Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

Driftdown/LRC Cruise Range Capability

Engine inoperative range capability is provided to determine the fuel and time required for a specified distance when the recommended driftdown procedure is followed.

Long Range Cruise Altitude Capability

Altitude capability is provided in the same format as the gear up data shown in Chapter 3 for Max Climb Thrust and Long Range Cruise speed with 100 ft/min residual rate of climb.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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Performance Inflight — Chapter PI
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Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	140
2000	180
2500	210
3000	230
3500	250
4000	280
4500	310

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)														
	DRY RUNWAY					WET RUNWAY					WET SKID-RESISTANT				
	100	120	140	160	180	100	120	140	160	180	100	120	140	160	180
300	-3	-3	-3	-3	-3										
200	-3	-3	-3	-2	-2										
100	-2	-2	-1	-1	-1										
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-100	4	4	4	3	2	3	3	2	1	1	3	3	2	1	1
-200	8	7	5	3	3	5	4	2	2	2	4	4	2	2	2
-300	8	8	5	3	3	7	7	4	3	3	4	4	2	2	2

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
360	184	186	199
340	180	183	196
320	173	177	190
300	164	172	184
280	158	166	178
260	152	160	172
240	146	154	165
220	140	148	158
200	134	141	151
180	126	133	143
160	119	125	134

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

Dry Snow Conversion Table

Dry Snow Depth (mm)	Equivalent Slush/Standing Water Depth (mm)
20	2.50
40	5.00
60	7.50
80	10.00
100	12.50

For dry snow, enter the Slush/Standing Water table with the equivalent depth shown in the table above.

ADVISORY INFORMATION

Slush/Standing Water Takeoff

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-39.2	-44.3	-49.4	-46.7	-51.8	-56.9	-59.3	-64.3	-69.4
380	-37.7	-42.8	-47.9	-44.7	-49.8	-54.9	-56.3	-61.4	-66.5
360	-36.3	-41.3	-46.4	-42.7	-47.8	-52.9	-53.3	-58.4	-63.5
340	-34.6	-39.7	-44.8	-40.6	-45.6	-50.7	-50.2	-55.3	-60.4
320	-32.6	-37.7	-42.8	-38.0	-43.1	-48.2	-46.6	-51.7	-56.8
300	-30.3	-35.4	-40.4	-35.1	-40.1	-45.2	-42.7	-47.8	-52.8
280	-27.5	-32.6	-37.7	-31.7	-36.8	-41.9	-38.3	-43.3	-48.4
260	-24.4	-29.5	-34.6	-28.0	-33.1	-38.1	-33.4	-38.5	-43.6
240	-20.9	-26.0	-31.1	-23.8	-28.9	-34.0	-28.2	-33.2	-38.3
220	-17.1	-22.2	-27.2	-19.3	-24.4	-29.4	-22.5	-27.6	-32.6
200	-12.8	-17.9	-23.0	-14.3	-19.4	-24.5	-16.4	-21.5	-26.5
180	-8.2	-13.3	-18.4	-9.0	-14.1	-19.2	-9.8	-14.9	-20.0
160	-3.5	-8.6	-13.7	-3.5	-8.6	-13.7	-3.1	-8.2	-13.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000				141.8			163.2		
2200	169.0			181.8			204.0	156.8	
2400	209.0	162.8		222.7	175.5		246.2	197.5	150.4
2600	251.0	202.6	156.5	265.7	216.1	169.2	290.3	239.4	191.0
2800	295.6	244.2	196.2	311.1	258.8	209.6	336.6	283.2	232.7
3000	343.2	288.4	237.5	359.4	303.8	251.9	384.9	329.1	276.2
3200	393.6	335.5	281.2		351.5	296.5		377.2	321.7
3400		385.6	327.8			343.8			369.5
3600			377.6			393.4			

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -55 m/+50 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-26	-24	-22	-21	-19	-17	-14	-12	-10
340	-28	-26	-24	-24	-22	-20	-15	-13	-11
320	-30	-28	-26	-25	-23	-21	-17	-15	-13
300	-30	-28	-26	-27	-25	-23	-18	-16	-14
280	-31	-29	-27	-27	-25	-23	-20	-18	-16
260	-31	-29	-27	-28	-26	-24	-21	-19	-17
240	-31	-29	-27	-28	-26	-24	-22	-20	-18
220	-30	-28	-26	-28	-26	-24	-23	-21	-19
200	-29	-27	-25	-28	-26	-24	-24	-22	-20
180	-28	-26	-24	-27	-25	-23	-24	-22	-20
160	-28	-26	-24	-26	-24	-22	-24	-22	-20

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Slippery Runway Takeoff

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	-1.5	-2.9	-20.1	-21.6	-23.0	-39.9	-41.3	-42.8
380	0.0	-1.5	-2.9	-20.6	-22.1	-23.5	-38.8	-40.2	-41.7
360	0.0	-1.5	-2.9	-21.1	-22.6	-24.0	-37.7	-39.1	-40.6
340	-1.8	-3.2	-4.7	-21.5	-23.0	-24.4	-36.5	-37.9	-39.4
320	-4.2	-5.6	-7.1	-21.7	-23.1	-24.6	-35.2	-36.6	-38.1
300	-5.6	-7.1	-8.5	-21.5	-23.0	-24.4	-33.7	-35.2	-36.6
280	-6.2	-7.7	-9.1	-21.0	-22.4	-23.9	-31.9	-33.4	-34.8
260	-6.3	-7.7	-9.2	-19.7	-21.1	-22.6	-29.4	-30.8	-32.3
240	-5.8	-7.3	-8.7	-17.7	-19.1	-20.6	-26.1	-27.5	-29.0
220	-4.8	-6.3	-7.7	-15.0	-16.4	-17.9	-22.0	-23.4	-24.9
200	-3.3	-4.8	-6.2	-11.5	-13.0	-14.4	-17.1	-18.6	-20.0
180	-1.3	-2.7	-4.2	-7.3	-8.8	-10.2	-11.5	-13.0	-14.4
160	0.0	-0.5	-2.0	-2.8	-4.3	-5.7	-5.6	-7.1	-8.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	125.7								
1600	212.9	159.7							
1800	299.1	246.6	193.7						
2000	384.4	332.5	280.3	174.3	126.3				
2200		417.5	365.7	232.1	182.7	134.7			
2400				294.0	240.9	191.1	150.3		
2600				361.2	303.6	249.9	184.5	138.6	
2800					371.6	313.3	219.9	172.9	127.0
3000						382.0	257.6	207.6	161.2
3200							298.1	244.5	195.6
3400							342.2	284.0	231.7
3600							389.8	326.7	270.2
3800								373.5	311.8
4000									357.3

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+35 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+55 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-5	-3	-19	-17	-15	-33	-31	-29
340	-9	-7	-5	-21	-19	-17	-35	-33	-31
320	-11	-9	-7	-23	-21	-19	-38	-36	-34
300	-12	-10	-8	-25	-23	-21	-39	-37	-35
280	-12	-10	-8	-26	-24	-22	-40	-38	-36
260	-13	-11	-9	-26	-24	-22	-41	-39	-37
240	-13	-11	-9	-27	-25	-23	-42	-40	-38
220	-13	-11	-9	-27	-25	-23	-42	-40	-38
200	-14	-12	-10	-27	-25	-23	-42	-40	-38
180	-14	-12	-10	-28	-26	-24	-42	-40	-38
160	-15	-13	-11	-29	-27	-25	-41	-39	-37

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

Takeoff Speeds - Dry Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
380	185	196	201	175	184	190	171	176	182
360	179	190	196	170	179	185	166	171	178
340	175	185	192	165	174	181	162	166	174
320	169	179	187	160	168	177	156	161	170
300	164	172	182	154	162	172	151	155	165
280	157	165	177	148	155	167	145	148	160
260	150	158	171	142	149	162	138	142	155
240	142	151	166	134	142	156	131	135	150
220	133	143	160	126	134	151	122	128	145
200	123	135	154	117	127	145	113	121	139
180	114	126	147	107	118	139	103	113	133
160	104	117	139	97	110	131	93	105	126

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	12	14					7	8					-4	-4				
60	140	8	10	12	14			4	6	7	8			-3	-3	-4	-4		
50	122	5	6	8	10	13	16	3	4	5	6	8	9	-2	-2	-3	-3	-4	-5
40	104	1	3	5	7	10	13	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4
30	86	0	0	2	5	8	11	0	0	2	3	5	7	0	0	-1	-2	-2	-3
20	68	0	0	2	4	6	9	0	0	1	2	4	6	0	0	-1	-1	-2	-3
-60	-76	0	0	2	4	6	8	0	0	1	2	4	5	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
380	-4	-1	0	3	5	-2	-1	0	0	1	3	4	4
360	-4	-1	0	3	5	-2	-1	0	0	1	3	3	4
340	-3	-1	0	3	4	-2	-1	0	0	1	2	3	3
320	-3	-1	0	2	4	-2	-1	0	0	1	2	3	3
300	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3
280	-2	-1	0	2	3	-2	-1	0	0	1	2	2	3
260	-2	0	0	2	3	-2	-1	0	0	1	2	2	3
240	-2	0	0	2	3	-1	-1	0	0	1	2	2	3
220	-1	0	0	2	3	-1	-1	0	0	1	2	3	3
200	-1	0	0	3	4	-1	0	0	0	1	2	3	4
180	-1	0	0	3	4	-1	0	1	0	1	3	3	4
160	-1	1	0	3	4	-1	0	1	0	2	3	4	5

Clearway and Stopway V1 Adjustments*

NORMAL V1 (KIAS)	CLEARWAY MINUS STOPWAY (M)						
	300	200	100	0	-100	-200	-300
100	-3	-3	-2	0	4	8	8
120	-3	-3	-2	0	4	7	8
140	-3	-3	-1	0	4	5	5
160	-3	-2	-1	0	3	3	3
180	-3	-2	-1	0	2	3	3

***V1 not to exceed VR.**

ADVISORY INFORMATION

Takeoff Speeds - Dry Runway

Max Allowable Clearway for V1 Adjustment

FIELD LENGTH (M)	1500	2000	2500	3000	3500	4000	4500
MAX ALLOWABLE CLEARWAY (M)	140	180	210	230	250	280	310

ADVISORY INFORMATION

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
380	180	196	201	169	184	190	165	176	182
360	173	190	196	163	179	185	158	171	178
340	167	185	192	157	174	181	153	166	174
320	160	179	187	151	168	177	147	161	170
300	153	172	182	144	162	172	140	155	165
280	146	165	177	137	155	167	133	148	160
260	138	158	171	130	149	162	126	142	155
240	130	151	166	122	142	156	119	135	150
220	121	143	160	114	134	151	111	128	145
200	112	135	154	106	127	145	103	121	139
180	102	126	147	96	118	139	93	113	133
160	92	117	139	88	110	131	84	105	126

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	14	16					7	8					-4	-4				
60	140	10	11	14	16			4	6	7	8			-3	-3	-4	-4		
50	122	5	7	9	12	14	17	3	4	5	6	8	9	-2	-2	-3	-3	-4	-5
40	104	2	3	6	8	11	14	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4
30	86	0	0	3	5	8	12	0	0	2	3	5	7	0	0	-1	-2	-2	-3
20	68	0	0	2	4	7	10	0	0	1	2	4	6	0	0	-1	-1	-2	-3
-60	-76	0	0	2	4	6	9	0	0	1	2	4	5	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
380	-6	-3	0	3	6	-3	-2	-1	0	1	2	3	4
360	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
340	-6	-3	0	3	5	-4	-3	-1	0	1	2	3	4
320	-5	-3	0	3	5	-5	-3	-2	0	1	2	3	4
300	-5	-3	0	2	5	-5	-3	-2	0	1	2	3	4
280	-5	-2	0	2	5	-5	-3	-2	0	1	2	3	4
260	-4	-2	0	2	4	-5	-3	-1	0	1	2	3	4
240	-4	-2	0	2	4	-5	-3	-1	0	1	3	4	5
220	-3	-1	0	3	4	-5	-3	-1	0	1	3	4	5
200	-2	-1	0	3	5	-4	-2	-1	0	2	3	4	5
180	-2	0	0	3	5	-4	-2	0	0	2	4	5	6
160	-1	1	0	4	5	-3	-2	0	0	2	4	6	7

Stopway V1 Adjustments*

NORMAL V1 (KIAS)	STOPWAY (M)			
	0	100	200	300
100	0	3	5	7
120	0	3	4	7
140	0	2	2	4
160	0	1	2	3
180	0	1	2	3

Use of clearway not allowed on wet runways.
***V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 Slush/Standing Water Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-36.9	-41.5	-46.1	-44.3	-49.0	-53.6	-56.9	-61.6	-66.2
380	-35.4	-40.1	-44.7	-42.4	-47.0	-51.6	-54.0	-58.7	-63.3
360	-34.0	-38.7	-43.3	-40.5	-45.1	-49.8	-51.2	-55.9	-60.6
340	-32.7	-37.4	-42.1	-38.7	-43.4	-48.1	-48.6	-53.3	-58.0
320	-31.4	-36.1	-40.9	-36.9	-41.6	-46.3	-45.8	-50.5	-55.3
300	-29.6	-34.4	-39.2	-34.6	-39.3	-44.1	-42.5	-47.3	-52.1
280	-27.4	-32.2	-37.0	-31.8	-36.6	-41.4	-38.7	-43.5	-48.3
260	-24.8	-29.6	-34.4	-28.6	-33.4	-38.2	-34.5	-39.3	-44.1
240	-21.7	-26.6	-31.4	-24.9	-29.7	-34.6	-29.7	-34.5	-39.4
220	-18.3	-23.1	-28.0	-20.7	-25.6	-30.5	-24.4	-29.3	-34.2
200	-14.3	-19.2	-24.1	-16.1	-21.0	-25.9	-18.7	-23.6	-28.5
180	-10.0	-14.9	-19.8	-11.1	-16.0	-20.9	-12.4	-17.3	-22.2
160	-5.3	-10.2	-15.1	-5.6	-10.5	-15.4	-5.7	-10.7	-15.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800				122.9			144.1		
2000	153.3			165.9			187.7	137.2	
2200	196.1	146.6		209.5	159.1		232.6	180.8	130.4
2400	241.0	189.3	139.9	255.4	202.5	152.3	279.8	225.4	173.9
2600	288.8	233.7	182.5	304.2	248.0	195.5	329.6	272.2	218.2
2800	340.4	281.0	226.5	356.6	296.3	240.6	382.1	321.5	264.6
3000	395.5	332.0	273.3	411.1	348.0	288.5	435.2	373.7	313.5
3200		386.8	323.7		402.4	339.6		426.8	365.4
3400			378.0			393.8			418.4
3600			433.3						

1. **Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -50 m/+50 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO1 Slush/Standing Water Takeoff
8% Thrust Reduction
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-24	-22	-20	-19	-17	-15	-11	-9	-7
340	-26	-24	-22	-22	-19	-17	-13	-11	-8
320	-28	-26	-24	-23	-21	-19	-14	-12	-10
300	-29	-27	-25	-25	-23	-21	-16	-14	-12
280	-30	-27	-25	-26	-24	-21	-18	-15	-13
260	-30	-27	-25	-26	-24	-22	-19	-17	-15
240	-29	-27	-25	-26	-24	-22	-20	-18	-16
220	-29	-27	-25	-27	-25	-22	-22	-20	-17
200	-29	-27	-24	-27	-25	-23	-23	-21	-18
180	-28	-26	-24	-27	-25	-22	-23	-21	-19
160	-28	-26	-24	-26	-24	-22	-24	-22	-19

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff
8% Thrust Reduction
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	-0.8	-2.1	-17.3	-18.6	-19.9	-37.1	-38.5	-39.8
380	0.0	-0.8	-2.2	-17.8	-19.1	-20.5	-36.1	-37.4	-38.7
360	0.0	-0.9	-2.2	-18.4	-19.7	-21.0	-35.0	-36.4	-37.7
340	0.0	-0.9	-2.2	-19.0	-20.3	-21.6	-34.2	-35.5	-36.9
320	-1.6	-3.0	-4.3	-19.6	-20.9	-22.3	-33.3	-34.7	-36.1
300	-4.0	-5.3	-6.7	-19.9	-21.3	-22.6	-32.3	-33.7	-35.1
280	-5.3	-6.6	-8.0	-19.9	-21.3	-22.7	-31.1	-32.5	-33.9
260	-5.8	-7.2	-8.5	-19.4	-20.7	-22.1	-29.4	-30.8	-32.2
240	-5.7	-7.1	-8.5	-18.0	-19.4	-20.8	-26.8	-28.2	-29.6
220	-5.1	-6.5	-7.9	-15.8	-17.2	-18.6	-23.3	-24.7	-26.1
200	-3.9	-5.3	-6.7	-12.9	-14.3	-15.7	-19.0	-20.5	-21.9
180	-2.2	-3.6	-5.0	-9.1	-10.5	-12.0	-13.9	-15.3	-16.7
160	0.0	-1.4	-2.9	-4.7	-6.1	-7.5	-8.0	-9.5	-10.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	156.8								
1600	247.8	192.4	136.7						
1800	337.7	283.0	227.9	143.4					
2000	426.9	372.5	318.1	202.7	166.5	130.4			
2200			407.3	265.5	226.7	189.5	134.9		
2400				333.6	291.4	251.3	170.8	148.9	127.0
2600				406.9	361.9	318.1	207.3	184.9	162.9
2800					435.6	390.7	246.1	222.1	199.1
3000							287.9	262.0	237.4
3200							333.5	305.2	278.5
3400							383.4	352.6	323.1
3600							434.0	403.1	372.3
3800									422.8

1. **Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+40 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+60 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff

8% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-6	-4	-18	-16	-14	-31	-29	-27
340	-9	-7	-6	-20	-19	-17	-34	-32	-30
320	-11	-9	-7	-22	-20	-19	-36	-34	-32
300	-12	-10	-8	-24	-22	-20	-37	-35	-34
280	-12	-10	-9	-25	-23	-21	-39	-37	-35
260	-13	-11	-9	-25	-23	-21	-39	-37	-35
240	-13	-11	-9	-25	-24	-22	-40	-38	-36
220	-14	-12	-10	-26	-24	-23	-40	-38	-37
200	-15	-13	-11	-27	-25	-23	-41	-39	-37
180	-15	-14	-12	-28	-26	-24	-41	-39	-37
160	-16	-15	-13	-29	-27	-25	-41	-40	-38

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO1 Takeoff Speeds - Dry Runway

8% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
360	183	191	195	173	179	183			
340	178	186	191	169	175	180	165	168	173
320	173	180	186	164	169	176	160	162	169
300	167	174	181	158	163	171	155	156	164
280	161	167	176	152	157	166	149	150	159
260	154	160	170	146	150	161	142	144	154
240	146	153	165	138	143	155	134	137	149
220	137	145	159	130	136	150	126	130	144
200	128	137	152	121	129	144	118	123	138
180	117	128	146	112	120	137	108	115	132
160	107	118	139	100	111	130	97	106	125

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	11	13					6	7					-3	-4				
60	140	7	9	11	13			4	5	6	8			-2	-3	-3	-4		
50	122	4	5	7	9	11	14	2	3	5	6	7	9	-1	-2	-2	-3	-4	-5
40	104	1	2	4	6	9	12	1	2	3	4	6	7	-1	-1	-2	-2	-3	-4
30	86	0	0	2	4	7	10	0	0	1	3	4	6	0	0	-1	-1	-2	-3
20	68	0	0	1	3	5	8	0	0	1	2	3	5	0	0	0	-1	-2	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	5	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
360	-4	-1	0	3	4	-3	-2	-1	0	1	2	3	3
340	-3	-1	0	2	4	-3	-2	-1	0	1	2	2	3
320	-3	-1	0	2	3	-3	-2	-1	0	1	2	2	3
300	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	2
280	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
260	-2	-1	0	1	3	-2	-1	0	0	1	1	2	2
240	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
220	-2	-1	0	2	3	-2	-1	0	0	1	1	2	2
200	-2	-1	0	2	3	-2	-1	0	0	1	2	2	3
180	-2	0	0	2	3	-2	-1	0	0	1	2	3	3
160	-2	0	0	2	3	-2	-1	0	0	1	2	3	4

***V1 not to exceed VR**

ADVISORY INFORMATION

TO1 Takeoff Speeds - Wet Runway

8% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
360	177	191	195	166	179	183			
340	171	186	191	161	175	180	157	168	173
320	164	180	186	155	169	176	150	162	169
300	157	174	181	148	163	171	144	156	164
280	150	167	176	141	157	166	137	150	159
260	142	160	170	134	150	161	130	144	154
240	134	153	165	126	143	155	123	137	149
220	126	145	159	118	136	150	115	130	144
200	116	137	152	110	129	144	107	123	138
180	107	128	146	101	120	137	98	115	132
160	91	118	139	90	111	130	88	106	125

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	13	15					6	7					-3	-4				
60	140	9	10	12	15			4	5	6	8			-2	-3	-3	-4		
50	122	5	6	9	11	13	16	2	3	5	6	7	9	-1	-2	-2	-3	-4	-5
40	104	1	3	5	7	10	13	1	2	3	4	6	7	-1	-1	-2	-2	-3	-4
30	86	0	0	2	5	8	11	0	0	1	3	4	6	0	0	-1	-1	-2	-3
20	68	0	0	1	3	6	9	0	0	1	2	3	5	0	0	0	-1	-2	-2
-60	-76	0	0	1	3	6	8	0	0	1	2	3	5	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
360	-5	-2	0	3	6	-4	-2	-1	0	1	2	3	4
340	-5	-3	0	3	5	-4	-3	-1	0	1	2	3	4
320	-5	-3	0	3	5	-4	-3	-1	0	1	2	3	3
300	-5	-3	0	2	5	-5	-3	-2	0	1	2	3	3
280	-5	-3	0	2	4	-5	-3	-2	0	1	2	3	3
260	-5	-2	0	2	4	-5	-3	-2	0	1	2	3	4
240	-4	-2	0	2	4	-5	-3	-1	0	1	2	3	4
220	-4	-2	0	2	4	-5	-3	-1	0	1	2	3	4
200	-3	-1	0	2	4	-4	-3	-1	0	1	3	4	5
180	-2	0	0	3	4	-4	-2	-1	0	2	3	4	5
160	-1	0	0	3	5	-4	-2	0	0	2	4	5	6

***V1 not to exceed VR**

ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	-35.4	-40.5	-45.5	-42.8	-47.9	-53.0	-55.6	-60.6	-65.7
380	-33.9	-39.0	-44.1	-40.8	-45.9	-51.0	-52.6	-57.7	-62.7
360	-32.4	-37.5	-42.6	-38.8	-43.9	-49.0	-49.6	-54.7	-59.8
340	-30.9	-36.0	-41.1	-36.8	-41.9	-47.0	-46.8	-51.9	-56.9
320	-29.6	-34.7	-39.8	-35.1	-40.2	-45.3	-44.2	-49.3	-54.4
300	-28.6	-33.7	-38.8	-33.6	-38.7	-43.8	-41.9	-47.0	-52.1
280	-27.2	-32.2	-37.3	-31.7	-36.8	-41.9	-39.1	-44.1	-49.2
260	-25.2	-30.3	-35.4	-29.2	-34.3	-39.4	-35.6	-40.7	-45.8
240	-22.7	-27.8	-32.9	-26.2	-31.3	-36.3	-31.5	-36.6	-41.7
220	-19.8	-24.9	-29.9	-22.6	-27.7	-32.8	-26.9	-32.0	-37.1
200	-16.3	-21.4	-26.5	-18.5	-23.6	-28.6	-21.7	-26.8	-31.9
180	-12.4	-17.4	-22.5	-13.9	-18.9	-24.0	-15.9	-21.0	-26.1
160	-7.9	-13.0	-18.1	-8.7	-13.8	-18.8	-9.5	-14.6	-19.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600							132.1		
1800	146.9			159.5			181.1	124.3	
2000	195.1	139.4		208.5	151.8		231.6	173.4	
2200	245.8	187.4	131.8	260.4	200.6	144.1	284.9	223.4	165.6
2400	300.6	237.6	179.8	316.2	252.0	192.8	341.7	276.3	215.3
2600	360.4	291.6	229.4	376.5	307.1	243.6	401.5	332.5	267.7
2800	423.1	350.5	282.8	438.2	366.7	298.1		392.0	323.3
3000		413.2	340.9		428.4	357.0			382.5
3200			403.2			418.7			

1. **Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -55 m/+50 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-20	-18	-16	-15	-13	-11	-6	-4	-2
340	-23	-21	-19	-18	-16	-14	-8	-6	-4
320	-25	-23	-21	-20	-18	-16	-10	-8	-6
300	-26	-24	-22	-21	-19	-17	-11	-9	-7
280	-26	-24	-22	-22	-20	-18	-13	-11	-9
260	-26	-24	-22	-23	-21	-19	-15	-13	-11
240	-26	-24	-22	-23	-21	-19	-16	-14	-12
220	-25	-23	-21	-23	-21	-19	-17	-15	-13
200	-24	-22	-20	-22	-20	-18	-18	-16	-14
180	-23	-21	-19	-22	-20	-18	-18	-16	-14
160	-22	-20	-18	-21	-19	-17	-18	-16	-14

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	-1.5	-2.9	-15.0	-16.4	-17.9	-35.3	-36.7	-38.2
380	0.0	-1.5	-2.9	-15.5	-16.9	-18.4	-34.2	-35.6	-37.1
360	0.0	-1.5	-2.9	-16.0	-17.4	-18.9	-33.0	-34.5	-36.0
340	0.0	-1.5	-2.9	-16.5	-17.9	-19.4	-31.9	-33.4	-34.9
320	0.0	-1.5	-2.9	-17.0	-18.5	-19.9	-31.1	-32.6	-34.0
300	-1.2	-2.6	-4.1	-17.8	-19.3	-20.7	-30.6	-32.0	-33.5
280	-3.7	-5.1	-6.6	-18.3	-19.8	-21.2	-29.8	-31.3	-32.7
260	-5.0	-6.5	-7.9	-18.5	-19.9	-21.4	-28.8	-30.3	-31.7
240	-5.5	-7.0	-8.4	-18.0	-19.5	-20.9	-27.3	-28.7	-30.2
220	-5.4	-6.8	-8.3	-16.7	-18.1	-19.6	-24.7	-26.2	-27.6
200	-4.7	-6.1	-7.6	-14.4	-15.9	-17.3	-21.3	-22.7	-24.2
180	-3.4	-4.8	-6.3	-11.4	-12.8	-14.3	-16.9	-18.3	-19.8
160	-1.5	-2.9	-4.4	-7.4	-8.8	-10.3	-11.5	-13.0	-14.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	205.8	146.0							
1600	302.9	243.8	184.3	120.5					
1800	399.1	340.5	281.7	184.1	129.7				
2000		436.5	377.9	250.4	193.4	139.0	126.5		
2200				322.7	260.5	202.9	165.3		
2400				401.5	333.9	270.8	204.6	152.0	
2600					413.2	345.2	246.6	190.9	138.7
2800						424.8	292.1	231.8	177.6
3000							342.3	276.1	217.5
3200							397.1	324.5	260.5
3400								378.2	307.4
3600								433.3	359.4
3800									414.5

1. **Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -40 m/+35 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -60 m/+55 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

TO2 Slippery Runway Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-7	-5	-3	-16	-14	-12	-28	-26	-24
340	-9	-7	-5	-18	-16	-14	-30	-28	-26
320	-10	-8	-6	-20	-18	-16	-32	-30	-28
300	-11	-9	-7	-21	-19	-17	-34	-32	-30
280	-11	-9	-7	-22	-20	-18	-35	-33	-31
260	-12	-10	-8	-23	-21	-19	-36	-34	-32
240	-12	-10	-8	-23	-21	-19	-36	-34	-32
220	-12	-10	-8	-23	-21	-19	-36	-34	-32
200	-12	-10	-8	-23	-21	-19	-36	-34	-32
180	-13	-11	-9	-24	-22	-20	-36	-34	-32
160	-13	-11	-9	-24	-22	-20	-36	-34	-32

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

ADVISORY INFORMATION

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
320	177	182	185	168	171	175			
300	171	176	180	163	165	170	158	158	163
280	165	169	175	157	159	165	152	152	158
260	159	162	169	150	153	160	146	146	153
240	151	155	163	143	146	154	139	139	148
220	142	147	157	135	138	148	131	133	142
200	133	139	151	126	131	142	123	125	137
180	123	131	144	117	123	136	114	117	130
160	111	121	137	108	114	129	104	110	124

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	9	11					5	6					-3	-3				
60	140	6	7	9	11			3	4	6	7			-2	-2	-3	-4		
50	122	3	4	6	8	10	13	2	3	4	5	6	8	-1	-2	-2	-3	-3	-4
40	104	1	2	4	6	8	10	1	1	3	4	5	7	0	-1	-1	-2	-3	-3
30	86	0	0	2	4	6	8	0	0	1	3	4	6	0	0	-1	-1	-2	-3
20	68	0	0	1	3	5	7	0	0	1	2	3	5	0	0	0	-1	-2	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
320	-3	-1	0	2	2	-3	-1	0	0	1	1	2	2
300	-3	-1	0	1	2	-2	-1	-1	0	0	1	1	2
280	-3	-1	0	1	2	-2	-1	-1	0	0	1	1	2
260	-3	-1	0	1	2	-2	-1	-1	0	0	1	1	2
240	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
220	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
200	-2	-1	0	1	2	-2	-1	-1	0	0	1	2	2
180	-2	-1	0	1	2	-2	-1	-1	0	1	1	2	2
160	-2	-1	0	2	3	-2	-1	0	0	1	2	2	3

***V1 not to exceed VR**

ADVISORY INFORMATION

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

V1, VR, V2

WEIGHT (1000 KG)	FLAPS 5			FLAPS 15			FLAPS 20		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
320	170	182	185	160	171	175			
300	163	176	180	153	165	170	149	158	163
280	155	169	175	146	159	165	142	152	158
260	148	162	169	139	153	160	135	146	153
240	140	155	163	132	146	154	128	139	148
220	132	147	157	124	138	148	121	133	142
200	123	139	151	116	131	142	113	125	137
180	113	131	144	107	123	136	104	117	130
160	101	121	137	96	114	129	95	110	124

Check V1(MCG), Minimum VR.

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°C	°F	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	11	13					5	6					-3	-3				
60	140	7	9	11	13			3	4	6	7			-2	-2	-3	-4		
50	122	4	5	7	9	12	15	2	3	4	5	6	8	-1	-2	-2	-3	-3	-4
40	104	1	2	4	7	9	12	1	1	3	4	5	7	0	-1	-1	-2	-3	-3
30	86	0	0	2	5	7	10	0	0	1	3	4	6	0	0	-1	-1	-2	-3
20	68	0	0	1	3	6	8	0	0	1	2	3	5	0	0	0	-1	-2	-2
-60	-76	0	0	1	3	5	8	0	0	1	2	3	4	0	0	0	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
320	-5	-2	0	3	5	-4	-2	-1	0	1	2	3	4
300	-5	-2	0	2	5	-4	-3	-1	0	1	2	3	3
280	-5	-2	0	2	4	-4	-3	-1	0	1	2	2	3
260	-5	-2	0	2	4	-4	-3	-1	0	1	2	2	3
240	-4	-2	0	2	4	-4	-3	-1	0	1	2	3	3
220	-4	-2	0	2	4	-4	-3	-1	0	1	2	3	4
200	-3	-1	0	2	4	-4	-3	-1	0	1	2	3	4
180	-2	-1	0	2	4	-4	-2	-1	0	1	3	4	5
160	-2	0	0	3	4	-4	-2	0	0	2	3	4	5

***V1 not to exceed VR**

Minimum Control Speeds
V1(MCG), Minimum VR
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	116	118	113	115	111	113	109	111				
50	122	119	121	116	118	111	113	109	111	106	109	103	106
40	104	126	127	123	124	118	120	113	115	108	111	103	106
30	86	128	130	128	130	123	125	118	120	112	115	106	109
20	68	129	130	129	130	125	126	120	122	116	118	110	113
-60	-76	130	130	130	130	126	126	121	122	117	118	112	114

TO1 V1(MCG), Minimum VR
8% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	111	113	108	110	106	109	104	107				
50	122	114	116	111	113	106	109	104	107	102	105	99	102
40	104	121	122	118	120	113	115	108	111	104	106	99	102
30	86	123	124	123	124	118	120	113	115	108	110	103	105
20	68	123	125	123	124	120	121	116	118	111	114	106	108
-60	-76	125	125	124	125	121	121	117	118	112	114	108	110

TO2 V1(MCG), Minimum VR
20% Thrust Reduction

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	105	107	102	104	100	102	98	101				
50	122	107	109	104	107	100	103	98	101	96	99	93	96
40	104	113	115	110	112	106	108	102	104	97	100	93	96
30	86	115	117	114	116	110	112	106	108	101	104	96	99
20	68	116	117	115	116	111	113	108	110	104	106	99	102
-60	-76	117	118	116	117	113	114	109	111	105	107	101	103

Go-Around %N1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

REPORTED OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (1000 FT)												
°C	°F		-2	-1	0	1	2	3	4	5	6	7	8	9	10
66	150	70	93.7	93.8	94.1	93.9	93.8	93.7	93.6	93.4	93.3	92.6	91.5	90.5	89.6
56	133	60	96.5	96.6	96.9	96.7	96.6	96.5	96.4	96.2	96.1	95.4	94.3	93.4	92.5
51	124	55	97.8	98.0	98.3	98.1	97.9	97.9	97.7	97.6	97.4	96.7	95.7	94.7	93.9
46	115	50	99.1	99.3	99.6	99.4	99.3	99.2	99.1	98.9	98.7	98.0	97.0	96.1	95.2
41	106	45	100.2	100.7	101.1	101.0	100.9	100.7	100.5	100.4	100.0	99.3	98.3	97.3	96.5
36	97	40	101.5	102.4	103.2	103.2	102.8	102.6	102.3	102.0	101.4	100.5	99.5	98.6	97.8
31	88	35	101.2	103.9	105.8	105.4	105.1	104.7	104.3	103.8	102.7	101.7	100.6	99.7	98.9
26	79	30	100.4	103.1	105.9	106.8	107.3	106.8	106.6	106.4	105.0	103.4	101.9	100.8	100.0
21	70	25	99.5	102.2	105.0	105.9	106.5	107.0	107.4	107.4	106.8	105.7	104.0	102.3	101.3
16	61	20	98.7	101.4	104.1	105.0	105.6	106.1	106.5	107.0	106.8	106.3	105.2	104.2	103.3
11	53	15	97.9	100.5	103.2	104.1	104.7	105.2	105.6	106.1	105.9	105.5	104.9	104.4	104.0
7	44	10	97.0	99.6	102.3	103.2	103.8	104.3	104.7	105.1	105.0	104.6	104.0	103.5	103.4
2	35	5	96.1	98.7	101.4	102.3	102.9	103.4	103.8	104.2	104.1	103.7	103.1	102.6	102.5
-3	26	0	95.3	97.8	100.5	101.4	102.0	102.4	102.8	103.3	103.1	102.7	102.2	101.7	101.6
-13	8	-10	93.5	96.0	98.6	99.5	100.1	100.5	100.9	101.4	101.2	100.8	100.3	99.8	99.7
-23	-10	-20	91.7	94.2	96.7	97.6	98.2	98.6	99.0	99.4	99.3	98.9	98.3	97.9	97.8
-33	-27	-30	89.9	92.3	94.8	95.6	96.2	96.6	97.0	97.4	97.3	96.9	96.4	95.9	95.8
-43	-45	-40	88.0	90.4	92.8	93.6	94.2	94.6	95.0	95.4	95.3	94.9	94.4	93.9	93.9
-53	-63	-50	86.1	88.4	90.8	91.6	92.2	92.6	93.0	93.3	93.2	92.9	92.3	91.9	91.8

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)												
	-2	-1	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
1 PACK ON	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

***Packs on or off with 2 bleed sources.**
****Packs off with 1 bleed source.**

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**4.5**	**4.0**			
	V/S (FT/MIN)	2200	800			
30000 (280 KIAS)	**PITCH ATT**	**6.0**	**5.0**	**5.0**	**4.5**	**4.0**
	V/S (FT/MIN)	3300	2300	1600	1200	800
20000 (270 KIAS)	**PITCH ATT**	**9.0**	**8.0**	**7.5**	**7.5**	**7.0**
	V/S (FT/MIN)	4700	3400	2500	1900	1300
10000 (270 KIAS)	**PITCH ATT**	**13.0**	**10.5**	**10.0**	**9.5**	**9.0**
	V/S (FT/MIN)	6200	4500	3500	2700	2100
SEA LEVEL (270 KIAS)	**PITCH ATT**	**16.5**	**13.5**	**12.0**	**11.5**	**11.0**
	V/S (FT/MIN)	7200	5300	4100	3300	2700

Cruise

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**2.0**	**3.0**			
	%N1	80.2	84.8			
35000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.5**	
	%N1	77.7	80.4	84.1	90.4	
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.0**	**3.0**
	%N1	73.5	76.0	79.8	84.2	88.5
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**3.5**	**3.5**
	%N1	69.6	72.1	75.2	79.3	83.4
20000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.0**	**4.0**
	%N1	64.7	67.3	70.5	74.6	78.7
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.5**	**4.5**
	%N1	60.9	63.3	66.4	69.7	74.1

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG) 160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**-1.5**	**-0.5**			
	V/S (FT/MIN)	-2900	-2600			
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**0.5**	**0.5**
	V/S (FT/MIN)	-2400	-2000	-1900	-2100	-2500
20000 (270 KIAS)	**PITCH ATT**	**-1.5**	**0.0**	**1.0**	**2.0**	**1.5**
	V/S (FT/MIN)	-1900	-1700	-1600	-1500	-1600
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**0.0**	**1.0**	**2.0**	**2.5**
	V/S (FT/MIN)	-1700	-1500	-1400	-1400	-1400
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-2.0**	**-0.5**	**1.0**	**2.0**	**2.5**
	V/S (FT/MIN)	-1600	-1300	-1200	-1200	-1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		160	210	260	310	360
10000	**PITCH ATT**	**4.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	50.4	55.8	60.8	65.5	69.5
	KIAS	199	217	233	255	275
5000	**PITCH ATT**	**4.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	46.7	52.3	56.9	61.3	65.4
	KIAS	199	217	232	253	273

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		160	210	260	310	360
FLAPS UP	**PITCH ATT**	**4.5**	**5.5**	**6.0**	**6.0**	**6.5**
GEAR UP	%N1	47.6	53.5	58.5	62.9	67.4
VREF30+80	KIAS	200	218	233	250	265
FLAPS 1	**PITCH ATT**	**6.5**	**7.0**	**7.5**	**7.5**	**8.0**
GEAR UP	%N1	48.6	54.6	59.7	64.7	68.8
VREF30+60	KIAS	180	198	213	230	245
FLAPS 5	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**6.5**
GEAR UP	%N1	48.9	55.1	60.8	65.8	70.0
VREF30+40	KIAS	160	178	194	210	225
FLAPS 15	**PITCH ATT**	**6.5**	**6.5**	**7.0**	**7.0**	**7.0**
GEAR UP	%N1	50.1	56.6	62.7	67.4	72.2
VREF30+20	KIAS	140	158	173	190	205
FLAPS 20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
GEAR DOWN	%N1	55.7	62.7	69.1	74.4	79.3
VREF30+20	KIAS	140	158	173	190	205

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		160	210	260	310	360
FLAPS 20 VREF20+10	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**2.0**
	%N1	37.0	41.6	46.0	49.8	52.9
	KIAS	145	165	182	197	209
FLAPS 25 VREF25+10	**PITCH ATT**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**
	%N1	46.8	52.0	56.5	60.5	63.5
	KIAS	136	155	171	185	196
FLAPS 30 VREF30+10	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.0**	
	%N1	50.9	56.5	61.6	66.9	
	KIAS	130	148	163	180	

Intentionally
Blank

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Forward C.G. (7.5% MAC - FMC Default)
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	4	30400	28700	27200
350	28500	3	31000	29400	27800
340	29200	1	31600	30000	28500
330	29800	0	32100	30500	29000
320	30500	-2	32600	31000	29500
310	31200	-3	33200	31600	30000
300	31900	-5	33700	32100	30600
290	32600	-7	34300	32700	31200
280	33400	-8	34900	33300	31800
270	34100	-10	35500	33900	32400
260	34900	-12	36100	34500	33100
250	35800	-14	36800	35200	33800
240	36600	-15	37500	35900	34500
230	37500	-15	38200	36600	35200
220	38400	-15	39000	37400	36000
210	39400	-15	39700	38200	36800
200	40400	-15	40600	39100	37700
190	41500	-15	41500	39900	38600
180	42600	-15	42400	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42100

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	10	30400	28700	27200
350	28500	8	31000	29400	27800
340	29200	7	31600	30000	28500
330	29800	5	32100	30500	29000
320	30500	4	32600	31000	29500
310	31200	2	33200	31600	30000
300	31900	1	33700	32100	30600
290	32600	-1	34300	32700	31200
280	33400	-3	34900	33300	31800
270	34100	-4	35500	33900	32400
260	34900	-6	36100	34500	33100
250	35800	-8	36800	35200	33800
240	36600	-9	37500	35900	34500
230	37500	-9	38200	36600	35200
220	38400	-9	39000	37400	36000
210	39400	-9	39700	38200	36800
200	40400	-9	40600	39100	37700
190	41500	-9	41500	39900	38600
180	42600	-9	42400	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42100

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Forward C.G. (7.5% MAC - FMC Default)
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	15	30400	28700	27200
350	28500	14	31000	29400	27800
340	29200	13	31600	30000	28500
330	29800	11	32100	30500	29000
320	30500	10	32600	31000	29500
310	31200	8	33200	31600	30000
300	31900	6	33700	32100	30600
290	32600	5	34300	32700	31200
280	33400	3	34900	33300	31800
270	34100	1	35500	33900	32400
260	34900	-1	36100	34500	33100
250	35800	-2	36800	35200	33800
240	36600	-3	37500	35900	34500
230	37500	-3	38200	36600	35200
220	38400	-3	39000	37400	36000
210	39400	-3	39700	38200	36800
200	40400	-3	40600	39100	37700
190	41500	-3	41500	39900	38600
180	42600	-3	42400	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42100

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Mid C.G. (30% MAC)
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	4	31400	29800	28200
350	28500	3	32100	30400	28900
340	29200	1	32700	31000	29500
330	29800	0	33200	31500	30000
320	30500	-2	33700	32100	30500
310	31200	-3	34200	32600	31100
300	31900	-5	34700	33100	31600
290	32600	-7	35300	33700	32200
280	33400	-8	35900	34300	32800
270	34100	-10	36500	34900	33400
260	34900	-12	37100	35500	34100
250	35800	-14	37800	36200	34800
240	36600	-15	38500	36900	35500
230	37500	-15	39200	37600	36200
220	38400	-15	40000	38400	37000
210	39400	-15	40700	39200	37800
200	40400	-15	41600	40000	38600
190	41500	-15	42500	40900	39500
180	42600	-15	43100	41900	40500
170	43100	-15	43100	43100	41700
160	43100	-15	43100	43100	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	10	31400	29800	28200
350	28500	8	32100	30400	28900
340	29200	7	32700	31000	29500
330	29800	5	33200	31500	30000
320	30500	4	33700	32100	30500
310	31200	2	34200	32600	31100
300	31900	1	34700	33100	31600
290	32600	-1	35300	33700	32200
280	33400	-3	35900	34300	32800
270	34100	-4	36500	34900	33400
260	34900	-6	37100	35500	34100
250	35800	-8	37800	36200	34800
240	36600	-9	38500	36900	35500
230	37500	-9	39200	37600	36200
220	38400	-9	40000	38400	37000
210	39400	-9	40700	39200	37800
200	40400	-9	41600	40000	38600
190	41500	-9	42500	40900	39500
180	42600	-9	43100	41900	40500
170	43100	-9	43100	43100	41700
160	43100	-9	43100	43100	43000

Long Range Cruise Maximum Operating Altitude
Max Climb Thrust, Mid C.G. (30% MAC)
ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27900	15	31300*	29800	28200
350	28500	14	32000*	30400	28900
340	29200	13	32700	31000	29500
330	29800	11	33200	31500	30000
320	30500	10	33700	32100	30500
310	31200	8	34200	32600	31100
300	31900	6	34700	33100	31600
290	32600	5	35300	33700	32200
280	33400	3	35900	34300	32800
270	34100	1	36500	34900	33400
260	34900	-1	37100	35500	34100
250	35800	-2	37800	36200	34800
240	36600	-3	38500	36900	35500
230	37500	-3	39200	37600	36200
220	38400	-3	40000	38400	37000
210	39400	-3	40700	39200	37800
200	40400	-3	41600	40000	38600
190	41500	-3	42500	40900	39500
180	42600	-3	43100	41900	40500
170	43100	-3	43100	43100	41700
160	43100	-3	43100	43100	43000

***Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 25	27	29	31	33	35	37	39	41	43
360	%N1	84.5	86.2	87.7	90.3						
	MACH	.819	.840	.839	.837						
	KIAS	346	342	327	313						
	FF/ENG	5246	5242	5185	5376						
340	%N1	83.6	85.1	86.2	88.2	91.3					
	MACH	.819	.838	.840	.839	.836					
	KIAS	346	341	328	313	299					
	FF/ENG	5069	5026	4892	4942	5189					
320	%N1	82.7	83.8	85.1	86.3	88.6					
	MACH	.814	.832	.839	.840	.838					
	KIAS	344	338	327	314	299					
	FF/ENG	4864	4799	4667	4581	4709					
300	%N1	81.0	82.6	83.8	84.9	86.4	89.2				
	MACH	.796	.820	.835	.840	.839	.837				
	KIAS	336	333	326	314	300	286				
	FF/ENG	4551	4537	4449	4332	4312	4474				
280	%N1	79.2	81.0	82.4	83.7	84.8	86.6				
	MACH	.773	.802	.824	.837	.840	.839				
	KIAS	325	325	321	313	300	287				
	FF/ENG	4216	4238	4205	4115	4019	4052				
260	%N1	77.3	79.1	80.9	82.1	83.4	84.6	87.0			
	MACH	.747	.778	.806	.828	.838	.840	.838			
	KIAS	313	314	313	309	300	287	274			
	FF/ENG	3870	3915	3919	3885	3799	3718	3802			
240	%N1	75.5	77.0	78.8	80.6	81.8	83.1	84.7	87.8		
	MACH	.723	.749	.781	.809	.830	.839	.840	.838		
	KIAS	303	302	303	301	296	287	274	261		
	FF/ENG	3566	3573	3608	3608	3576	3490	3442	3570		
220	%N1	73.8	75.0	76.6	78.4	80.1	81.4	83.0	85.1	88.3	
	MACH	.703	.723	.750	.783	.810	.831	.839	.840	.838	
	KIAS	294	290	290	290	289	284	274	262	249	
	FF/ENG	3309	3267	3274	3304	3306	3269	3204	3192	3321	
200	%N1	71.9	73.2	74.4	75.9	77.8	79.5	81.3	83.2	85.3	
	MACH	.681	.701	.721	.749	.782	.810	.831	.839	.840	
	KIAS	284	281	277	277	277	276	271	262	250	
	FF/ENG	3057	3011	2971	2976	3003	3003	2983	2947	2935	
180	%N1	69.5	71.1	72.4	73.6	75.2	77.0	79.2	81.3	83.3	85.2
	MACH	.652	.677	.698	.718	.745	.778	.808	.830	.839	.840
	KIAS	271	270	268	264	263	264	262	258	250	239
	FF/ENG	2782	2757	2717	2682	2680	2699	2713	2721	2690	2659
160	%N1	66.8	68.4	70.0	71.5	72.7	74.1	76.3	78.9	81.1	83.1
	MACH	.616	.643	.669	.692	.712	.737	.770	.801	.826	.838
	KIAS	255	256	256	254	250	248	249	248	245	238
	FF/ENG	2490	2483	2460	2432	2399	2382	2404	2441	2457	2423

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
282	261	242	226	213	200	191	182	174	167	160
561	520	484	452	425	400	382	366	351	337	325
840	779	725	678	637	600	574	550	528	508	489
1120	1039	966	904	849	800	766	734	705	678	653
1401	1299	1208	1130	1062	1000	957	918	881	848	817
1683	1560	1451	1357	1274	1200	1149	1101	1057	1017	980
1966	1822	1694	1583	1487	1400	1340	1285	1234	1187	1144
2250	2085	1937	1811	1700	1600	1532	1469	1410	1356	1307
2535	2348	2181	2038	1913	1800	1723	1652	1586	1525	1470
2820	2611	2425	2265	2126	2000	1915	1835	1762	1695	1633

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10 FUEL (1000 KG)	10 TIME (HR:MIN)	14 FUEL (1000 KG)	14 TIME (HR:MIN)	20 FUEL (1000 KG)	20 TIME (HR:MIN)	24 FUEL (1000 KG)	24 TIME (HR:MIN)	28 FUEL (1000 KG)	28 TIME (HR:MIN)
200	4.0	0:38	3.5	0:37	2.9	0:35	2.5	0:34	2.3	0:34
400	8.2	1:12	7.5	1:08	6.5	1:04	5.9	1:02	5.5	1:00
600	12.4	1:46	11.4	1:40	10.1	1:33	9.3	1:30	8.7	1:26
800	16.5	2:20	15.4	2:12	13.6	2:02	12.6	1:58	11.9	1:52
1000	20.7	2:55	19.3	2:45	17.2	2:31	15.9	2:26	15.0	2:19
1200	24.7	3:30	23.1	3:17	20.7	3:00	19.2	2:54	18.1	2:45
1400	28.8	4:05	27.0	3:50	24.2	3:30	22.5	3:22	21.2	3:12
1600	32.8	4:41	30.8	4:24	27.6	4:00	25.7	3:50	24.3	3:39
1800	36.8	5:16	34.5	4:57	31.1	4:30	28.9	4:19	27.3	4:06
2000	40.8	5:52	38.3	5:31	34.5	5:00	32.1	4:48	30.3	4:34

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG) 170	190	210	230	250	270	290	310	330	350
5	-0.6	-0.5	-0.3	-0.2	0.0	0.2	0.4	0.6	0.8	1.0
10	-1.3	-1.0	-0.7	-0.3	0.0	0.4	0.9	1.3	1.8	2.2
15	-2.0	-1.5	-1.0	-0.5	0.0	0.7	1.4	2.1	2.8	3.4
20	-2.7	-2.1	-1.4	-0.7	0.0	1.0	1.9	2.9	3.8	4.7
25	-3.4	-2.6	-1.8	-0.9	0.0	1.2	2.4	3.6	4.8	5.9
30	-4.1	-3.1	-2.1	-1.1	0.0	1.5	3.0	4.4	5.8	7.2
35	-4.8	-3.7	-2.5	-1.2	0.0	1.8	3.5	5.2	6.9	8.5
40	-5.5	-4.2	-2.8	-1.4	0.0	2.1	4.1	6.0	7.9	9.7
45	-6.2	-4.7	-3.2	-1.6	0.0	2.3	4.6	6.8	9.0	11.0

Long Range Cruise Enroute Fuel and Time - High Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1032	976	925	879	838	800	767	736	708	682	657
1543	1460	1385	1317	1256	1200	1151	1106	1063	1024	989
2056	1946	1846	1756	1675	1600	1535	1475	1419	1367	1320
2571	2433	2308	2195	2094	2000	1920	1845	1775	1710	1651
3088	2922	2771	2635	2513	2400	2304	2214	2131	2053	1982
3606	3412	3235	3076	2932	2800	2688	2583	2486	2396	2313
4126	3904	3699	3517	3352	3200	3072	2953	2842	2739	2645
4649	4396	4165	3959	3772	3600	3456	3322	3197	3082	2976
5172	4890	4631	4400	4192	4000	3840	3691	3552	3424	3307
5697	5384	5098	4843	4612	4400	4224	4060	3908	3767	3637
6223	5880	5565	5285	5033	4800	4608	4429	4263	4109	3967
6751	6376	6034	5729	5453	5200	4992	4798	4617	4450	4297
7281	6874	6503	6172	5874	5600	5375	5166	4971	4791	4626
7812	7373	6973	6616	6295	6000	5759	5534	5324	5131	4954
8345	7874	7444	7061	6716	6400	6142	5901	5678	5471	5282
8880	8376	7915	7506	7138	6800	6525	6269	6030	5811	5610
9418	8880	8388	7952	7560	7200	6908	6636	6383	6150	5936
9959	9385	8863	8399	7982	7600	7291	7002	6735	6488	6262
10502	9893	9338	8846	8405	8000	7674	7369	7086	6826	6587

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
800	11.8	1:50	11.4	1:48	11.0	1:47	10.7	1:47	10.7	1:48
1200	17.8	2:43	17.3	2:40	16.8	2:37	16.4	2:37	16.2	2:38
1600	23.9	3:36	23.2	3:31	22.6	3:28	22.0	3:27	21.7	3:27
2000	29.9	4:30	29.1	4:22	28.4	4:18	27.6	4:17	27.2	4:17
2400	35.7	5:24	34.8	5:15	33.9	5:09	33.0	5:07	32.5	5:07
2800	41.5	6:19	40.5	6:08	39.5	6:00	38.4	5:57	37.8	5:57
3200	47.2	7:15	46.0	7:02	44.9	6:52	43.8	6:48	43.0	6:47
3600	52.8	8:11	51.5	7:56	50.2	7:45	49.0	7:39	48.1	7:37
4000	58.4	9:07	56.9	8:51	55.6	8:37	54.2	8:30	53.2	8:27
4400	63.7	10:05	62.2	9:47	60.7	9:32	59.2	9:22	58.0	9:18
4800	69.1	11:02	67.4	10:43	65.8	10:26	64.2	10:15	62.9	10:09
5200	74.3	12:00	72.5	11:40	70.8	11:21	69.1	11:08	67.7	11:00
5600	79.5	12:59	77.5	12:37	75.7	12:17	73.9	12:01	72.4	11:52
6000	84.7	13:58	82.5	13:35	80.6	13:13	78.7	12:55	77.1	12:44
6400	89.7	14:59	87.4	14:34	85.3	14:10	83.3	13:51	81.6	13:37
6800	94.6	15:59	92.2	15:33	90.0	15:07	87.9	14:46	86.1	14:30
7200	99.5	17:01	97.0	16:32	94.7	16:06	92.4	15:42	90.5	15:24
7600	104.3	18:04	101.6	17:33	99.2	17:04	96.8	16:40	94.8	16:19
8000	109.2	19:07	106.3	18:33	103.7	18:03	101.2	17:37	99.1	17:14

Long Range Cruise Enroute Fuel and Time - High Altitudes

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.3	-0.8	-0.4	0.0	0.7	2.4	4.9	8.4	12.7
20	-3.6	-2.8	-1.9	-0.9	0.0	1.4	4.0	7.7	12.5	18.5
30	-5.5	-4.3	-2.9	-1.5	0.0	2.1	5.5	10.2	16.3	23.7
40	-7.3	-5.7	-3.9	-2.0	0.0	2.7	6.9	12.5	19.7	28.3
50	-9.1	-7.1	-4.9	-2.5	0.0	3.3	8.2	14.6	22.7	32.3
60	-10.9	-8.5	-5.8	-2.9	0.0	3.9	9.4	16.5	25.3	35.7
70	-12.6	-9.8	-6.7	-3.4	0.0	4.4	10.5	18.2	27.5	38.6
80	-14.3	-11.0	-7.5	-3.8	0.0	4.9	11.4	19.6	29.4	40.8
90	-15.9	-12.2	-8.3	-4.2	0.0	5.4	12.3	20.8	30.9	42.5
100	-17.6	-13.3	-9.0	-4.6	0.0	5.8	13.1	21.8	32.0	43.6
110	-19.2	-14.4	-9.7	-5.0	0.0	6.3	13.8	22.6	32.7	44.1
120	-20.8	-15.4	-10.4	-5.3	0.0	6.7	14.4	23.2	33.1	44.0

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)										
	360	340	320	300	280	260	240	220	200	180	160
43							156	68	18	1	6
41						136	61	18	1	3	19
39						51	15	1	3	15	34
37			156	85	38	11	1	3	14	31	49
35		114	61	26	7	0	3	14	29	46	62
33	79	40	16	3	0	5	15	29	44	59	72
31	24	8	1	1	7	17	30	44	58	70	78
29	3	0	3	10	20	32	45	57	68	77	81
27	1	5	13	23	34	46	58	68	76	80	81
25	9	17	27	37	48	59	68	75	80	82	79

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	96	104	111	118	124	129	135	140	145	150
TIME (MINUTES)	20	21	22	23	24	24	25	26	26	27

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	%N1	62.4	65.4	69.5	74.3	78.9	83.5	88.5			
	KIAS	272	273	275	298	313	317	312			
	FF/ENG	4740	4690	4650	4800	4960	5140	5380			
340	%N1	60.9	63.8	67.9	72.3	77.3	82.1	86.6			
	KIAS	264	266	267	282	303	307	312			
	FF/ENG	4480	4440	4380	4450	4660	4800	4980			
320	%N1	59.4	62.1	66.3	70.4	75.7	80.3	85.0			
	KIAS	257	257	259	265	294	297	302			
	FF/ENG	4220	4180	4120	4130	4360	4460	4600			
300	%N1	57.8	60.4	64.6	68.6	73.8	78.5	83.2			
	KIAS	249	249	251	252	277	287	291			
	FF/ENG	3960	3920	3870	3850	4020	4130	4270			
280	%N1	56.2	58.7	62.8	66.8	71.6	76.6	81.3			
	KIAS	240	241	242	243	258	277	280			
	FF/ENG	3710	3670	3610	3590	3670	3830	3950			
260	%N1	54.4	56.9	60.8	64.9	69.3	74.6	79.3	84.1		
	KIAS	232	232	233	234	240	266	269	274		
	FF/ENG	3470	3420	3360	3330	3340	3540	3620	3750		
240	%N1	52.7	55.1	58.8	62.9	67.2	72.3	77.1	82.0		
	KIAS	226	226	226	226	226	248	258	262		
	FF/ENG	3250	3180	3110	3070	3070	3200	3310	3410		
220	%N1	50.9	53.2	56.8	60.7	64.9	69.6	74.7	79.6		
	KIAS	220	220	220	220	220	226	246	249		
	FF/ENG	3040	2960	2870	2830	2820	2850	3000	3090		
200	%N1	48.8	51.3	54.8	58.4	62.7	67.0	72.3	77.2	83.5	
	KIAS	213	213	213	213	213	213	233	237	241	
	FF/ENG	2830	2750	2650	2610	2580	2580	2690	2770	2930	
180	%N1	46.6	49.2	52.6	56.1	60.2	64.5	69.1	74.3	80.8	
	KIAS	206	206	206	206	206	206	208	224	227	
	FF/ENG	2640	2550	2450	2410	2360	2390	2350	2470	2590	
160	%N1	44.3	46.7	50.4	53.8	57.5	62.0	66.1	71.3	77.7	81.8
	KIAS	199	199	199	199	199	199	199	210	213	215
	FF/ENG	2500	2420	2320	2260	2210	2170	2160	2180	2270	2340

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding

Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	65.0	67.8	72.4	76.9	81.9
	KIAS	242	242	242	242	242
	FF/ENG	5180	5170	5150	5190	5300
340	%N1	63.3	66.1	70.5	75.0	80.0
	KIAS	240	240	240	240	240
	FF/ENG	4870	4840	4810	4840	4940
320	%N1	61.6	64.5	68.6	73.2	78.2
	KIAS	233	233	233	233	233
	FF/ENG	4570	4540	4510	4520	4610
300	%N1	59.8	62.7	66.8	71.5	76.3
	KIAS	224	224	224	224	224
	FF/ENG	4280	4250	4210	4210	4280
280	%N1	58.0	60.8	64.9	69.3	74.1
	KIAS	218	218	218	218	218
	FF/ENG	3990	3960	3910	3910	3950
260	%N1	56.2	58.7	62.9	67.0	71.8
	KIAS	212	212	212	212	212
	FF/ENG	3710	3670	3620	3610	3630
240	%N1	54.3	56.7	60.7	64.8	69.5
	KIAS	206	206	206	206	206
	FF/ENG	3450	3390	3330	3320	3330
220	%N1	52.3	54.7	58.4	62.5	66.8
	KIAS	200	200	200	200	200
	FF/ENG	3200	3130	3060	3030	3030
200	%N1	50.2	52.5	56.0	60.0	64.2
	KIAS	193	193	193	193	193
	FF/ENG	2960	2880	2790	2750	2740
180	%N1	47.8	50.2	53.6	57.2	61.5
	KIAS	186	186	186	186	186
	FF/ENG	2730	2640	2550	2500	2470
160	%N1	45.1	47.6	51.0	54.5	58.4
	KIAS	179	179	179	179	179
	FF/ENG	2560	2470	2370	2310	2280

This table includes 5% additional fuel for holding in a racetrack pattern.

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	915	+25/-15	20	-40	140	10	-10	20	-20	75	20	45
MAX AUTO	1235	+20/-15	30	-55	190	0	0	30	-30	125	0	0
AUTOBRAKE 4	1600	+30/-20	45	-75	270	0	-5	45	-45	175	5	5
AUTOBRAKE 3	1885	+40/-30	55	-95	335	5	-20	55	-55	180	10	15
AUTOBRAKE 2	2125	+45/-35	65	-105	380	30	-50	55	-60	155	90	100
AUTOBRAKE 1	2345	+50/-40	75	-120	445	70	-70	65	-65	155	250	335

Good Reported Braking Action

MAX MANUAL	1275	+25/-20	35	-65	235	30	-25	35	-35	105	85	195
MAX AUTO	1370	+25/-20	35	-60	235	25	-15	35	-35	120	90	215
AUTOBRAKE 4	1595	+30/-30	45	-75	275	5	-5	45	-45	175	10	45
AUTOBRAKE 3	1880	+40/-35	55	-95	335	5	-20	55	-55	180	10	15

Medium Reported Braking Action

MAX MANUAL	1695	+35/-30	55	-95	375	75	-55	50	-50	130	225	590
MAX AUTO	1760	+35/-30	50	-90	365	75	-50	45	-45	135	225	595
AUTOBRAKE 4	1805	+40/-35	50	-95	375	55	-35	50	-50	175	205	585
AUTOBRAKE 3	1955	+40/-35	55	-105	400	40	-40	55	-55	180	115	425

Poor Reported Braking Action

MAX MANUAL	2125	+50/-45	75	-135	570	160	-105	65	-65	145	475	1435
MAX AUTO	2225	+50/-45	70	-130	560	160	-105	65	-65	145	485	1460
AUTOBRAKE 4	2225	+50/-45	75	-130	560	160	-95	65	-65	155	480	1450
AUTOBRAKE 3	2255	+50/-45	70	-135	570	135	-90	70	-65	180	425	1410

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	960	+25/-15	20	-40	140	10	-10	20	-20	75	20	50
MAX AUTO	1325	+20/-15	35	-55	195	0	0	35	-35	130	0	0
AUTOBRAKE 4	1725	+30/-20	45	-80	280	5	-5	50	-50	185	5	5
AUTOBRAKE 3	2045	+35/-30	60	-100	350	5	-30	60	-60	180	20	25
AUTOBRAKE 2	2290	+40/-40	70	-110	395	35	-55	65	-65	160	125	135
AUTOBRAKE 1	2510	+50/-45	80	-125	460	75	-75	70	-70	160	295	410

Good Reported Braking Action

MAX MANUAL	1350	+20/-25	35	-65	240	35	-30	35	-35	105	95	220
MAX AUTO	1455	+25/-25	35	-65	240	25	-15	35	-35	130	95	235
AUTOBRAKE 4	1725	+30/-30	45	-80	285	5	-5	50	-50	185	15	45
AUTOBRAKE 3	2035	+35/-40	60	-100	350	5	-30	60	-60	180	20	25

Medium Reported Braking Action

MAX MANUAL	1795	+35/-35	55	-100	385	80	-60	50	-50	130	250	660
MAX AUTO	1865	+35/-35	55	-95	375	75	-50	50	-50	140	250	665
AUTOBRAKE 4	1920	+35/-35	55	-100	390	55	-35	55	-55	185	210	635
AUTOBRAKE 3	2110	+40/-40	65	-110	415	40	-45	60	-60	180	130	455

Poor Reported Braking Action

MAX MANUAL	2255	+50/-45	80	-140	585	165	-110	70	-70	150	520	1595
MAX AUTO	2360	+50/-45	80	-135	575	170	-105	70	-70	145	530	1620
AUTOBRAKE 4	2360	+50/-45	80	-135	575	170	-100	70	-70	165	530	1615
AUTOBRAKE 3	2410	+50/-50	80	-140	585	135	-95	70	-70	180	450	1555

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	1050	+30/-15	25	-40	135	15	-10	25	-25	75	30	60
MAX AUTO	1465	+20/-25	35	-60	200	0	0	40	-40	140	0	0
AUTOBRAKE 4	1925	+30/-35	55	-85	285	5	-5	55	-55	195	5	5
AUTOBRAKE 3	2265	+40/-45	70	-105	355	15	-30	65	-65	195	30	35
AUTOBRAKE 2	2445	+50/-50	80	-120	400	45	-60	70	-70	175	165	175
AUTOBRAKE 1	2635	+55/-60	95	-135	465	90	-95	80	-80	170	380	515

Good Reported Braking Action

MAX MANUAL	1490	+25/-25	40	-65	235	35	-30	35	-40	105	115	275
MAX AUTO	1540	+25/-25	40	-70	240	20	-15	40	-40	140	110	280
AUTOBRAKE 4	1930	+30/-35	55	-85	295	10	-5	55	-55	195	15	50
AUTOBRAKE 3	2265	+40/-45	70	-105	355	15	-30	65	-65	195	30	35

Medium Reported Braking Action

MAX MANUAL	1995	+40/-40	65	-105	380	85	-70	55	-55	135	300	800
MAX AUTO	1995	+40/-40	65	-100	375	80	-60	55	-55	145	300	795
AUTOBRAKE 4	2080	+40/-40	65	-105	385	55	-35	60	-60	195	230	750
AUTOBRAKE 3	2335	+45/-45	70	-115	420	45	-50	65	-65	195	140	530

Poor Reported Braking Action

MAX MANUAL	2515	+55/-55	90	-150	570	180	-125	70	-70	155	615	1910
MAX AUTO	2515	+55/-50	90	-145	565	180	-120	70	-70	155	620	1925
AUTOBRAKE 4	2515	+55/-50	90	-145	565	180	-110	70	-70	180	620	1915
AUTOBRAKE 3	2595	+55/-55	90	-150	580	145	-105	75	-75	195	520	1835

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 70 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1810	35/-35	60	-100/370	80/-60	25/-25	125	255	670
ANTISKID (FLAPS 30)	VREF30	1710	35/-25	55	-95/360	75/-60	25/-25	125	230	605
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1060	35/-15	25	-40/150	15/-10	10/-10	80	-	50
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	930	25/-10	20	-35/130	10/-10	10/-10	75	-	40
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1170	50/-15	35	-45/175	20/-15	20/-20	85	50	115
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1065	35/-10	25	-40/150	10/-10	10/-10	80	30	65
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1050	30/-15	25	-40/145	10/-10	10/-10	75	25	60
FLAPS PRIMARY FAIL	VREF20	1200	25/-15	25	-45/150	15/-15	15/-15	100	35	80
FLAP/SLAT CONTROL	VREF20	1050	30/-15	25	-40/145	10/-10	10/-10	75	25	60
FLIGHT CONTROL MODE	VREF20	1215	25/-15	30	-45/155	15/-15	15/-15	100	40	85
HYD PRESS SYS C	VREF20	1200	25/-15	25	-45/150	15/-15	15/-15	100	35	80
HYD PRESS SYS L+C	VREF30+20	1330	35/-15	35	-50/170	20/-20	20/-20	125	-	60
HYD PRESS SYS L+R	VREF30+20	1440	30/-15	35	-60/200	35/-30	20/-20	140	-	-
HYD PRESS SYS R+C	VREF30+20	1635	25/-15	45	-65/230	45/-35	25/-25	160	-	135
HYD PRESS SYS L (FLAPS 25)	VREF25	1045	25/-15	25	-45/145	15/-15	10/-10	90	-	35
HYD PRESS SYS L (FLAPS 30)	VREF30	995	25/-10	20	-40/140	15/-10	10/-10	90	-	30
HYD PRESS SYS R (FLAPS 25)	VREF25	1150	15/-15	25	-50/170	20/-20	15/-15	100	-	50
HYD PRESS SYS R (FLAPS 30)	VREF30	1085	20/-15	25	-45/160	20/-20	15/-15	100	-	45
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1205	45/-15	35	-45/170	20/-15	20/-20	85	45	105
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1070	35/-10	25	-40/140	10/-10	10/-10	75	30	65
PRI FLIGHT COMPUTERS	VREF20	1215	25/-15	30	-45/155	15/-15	15/-15	100	40	85
SLATS DRIVE	VREF30+30	1155	35/-15	30	-45/160	15/-10	10/-10	80	35	75
STABILIZER	VREF30+20	1070	35/-10	25	-40/140	10/-10	10/-10	75	30	65

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1810	35/-35	60	-100/370	80/-60	25/-25	125	255	670
ANTISKID (FLAPS 30)	VREF30	1710	35/-25	55	-95/360	75/-60	25/-25	125	230	605
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1565	25/-25	45	-75/255	45/-35	25/-25	115	-	195
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1345	25/-20	35	-65/240	40/-30	20/-20	110	-	150
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1690	30/-25	50	-70/255	40/-35	25/-25	105	155	380
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	130	305
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1490	25/-25	45	-65/240	35/-30	20/-20	105	115	270
FLAPS PRIMARY FAIL	VREF20	1665	25/-30	50	-75/260	45/-35	25/-25	130	145	345
FLAP/SLAT CONTROL	VREF20	1490	25/-25	45	-65/240	35/-30	20/-20	105	115	270
FLIGHT CONTROL MODE	VREF20	1695	25/-30	50	-75/260	45/-40	25/-25	135	150	365
HYD PRESS SYS C	VREF20	1665	25/-30	50	-75/260	45/-35	25/-25	130	145	345
HYD PRESS SYS L+C	VREF30+20	1960	35/-25	60	-90/305	70/-60	30/-30	175	-	255
HYD PRESS SYS L+R	VREF30+20	2100	35/-25	60	-100/340	100/-75	35/-35	200	-	-
HYD PRESS SYS R+C	VREF30+20	1990	35/-25	60	-90/310	75/-60	30/-30	185	-	270
HYD PRESS SYS L (FLAPS 25)	VREF25	1550	25/-25	45	-75/265	50/-45	20/-20	130	-	160
HYD PRESS SYS L (FLAPS 30)	VREF30	1470	30/-20	40	-70/260	50/-40	20/-20	130	-	145
HYD PRESS SYS R (FLAPS 25)	VREF25	1550	25/-25	45	-75/265	50/-45	20/-20	130	-	160
HYD PRESS SYS R (FLAPS 30)	VREF30	1455	25/-20	40	-70/255	45/-40	20/-20	130	-	140
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1725	30/-25	50	-75/255	45/-35	25/-25	105	150	365
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	120	285
PRI FLIGHT COMPUTERS	VREF20	1695	25/-30	50	-75/260	45/-40	25/-25	135	150	365
SLATS DRIVE	VREF30+30	1635	30/-25	50	-70/255	40/-35	20/-20	110	135	320
STABILIZER	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	120	285

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2265	45/-45	80	-135/555	170/-110	35/-35	145	525	1620
ANTISKID (FLAPS 30)	VREF30	2135	50/-35	75	-135/545	160/-105	30/-30	140	480	1455
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2210	45/-45	70	-115/430	120/-90	35/-35	155	-	580
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1865	40/-30	60	-105/395	105/-75	25/-25	145	-	445
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2295	45/-35	80	-110/400	90/-75	40/-40	135	410	1160
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2045	45/-35	65	-105/385	90/-70	30/-30	135	340	925
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1990	40/-35	65	-105/385	90/-65	30/-30	130	300	800
FLAPS PRIMARY FAIL	VREF20	2190	45/-45	75	-110/405	100/-75	35/-35	160	360	985
FLAP/SLAT CONTROL	VREF20	1990	40/-35	65	-105/385	90/-65	30/-30	130	300	800
FLIGHT CONTROL MODE	VREF20	2235	45/-45	75	-115/410	105/-80	35/-35	165	380	1060
HYD PRESS SYS C	VREF20	2190	45/-45	75	-110/405	100/-75	35/-35	160	360	985
HYD PRESS SYS L+C	VREF30+20	2755	55/-40	90	-140/510	185/-130	45/-45	220	-	770
HYD PRESS SYS L+R	VREF30+20	3375	60/-40	105	-180/640	355/-225	60/-60	275	-	-
HYD PRESS SYS R+C	VREF30+20	2790	55/-40	95	-140/510	190/-135	45/-45	225	-	800
HYD PRESS SYS L (FLAPS 25)	VREF25	2210	40/-40	75	-120/455	140/-100	35/-35	170	-	505
HYD PRESS SYS L (FLAPS 30)	VREF30	2085	45/-30	65	-120/445	135/-95	35/-35	170	-	460
HYD PRESS SYS R (FLAPS 25)	VREF25	2190	40/-40	70	-120/455	135/-100	35/-35	170	-	495
HYD PRESS SYS R (FLAPS 30)	VREF30	2035	45/-30	65	-115/440	130/-90	30/-30	160	-	430
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2300	45/-35	80	-110/405	95/-75	35/-35	135	385	1045
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2025	45/-35	65	-105/385	90/-65	25/-25	130	310	815
PRI FLIGHT COMPUTERS	VREF20	2235	45/-45	75	-115/410	105/-80	35/-35	165	380	1060
SLATS DRIVE	VREF30+30	2180	45/-35	75	-105/400	95/-75	25/-25	135	340	905
STABILIZER	VREF30+20	2025	45/-35	65	-105/385	90/-65	25/-25	130	310	815

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2920	70/-65	115	-210/995	810/-220	45/-45	160	1325	5000
ANTISKID (FLAPS 30)	VREF30	2750	75/-55	105	-205/975	785/-210	45/-45	155	1220	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2945	65/-60	105	-175/680	300/-180	50/-50	185	-	1480
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2465	55/-45	85	-160/630	255/-150	40/-40	170	-	1125
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2900	65/-50	115	-150/605	195/-130	50/-50	160	845	2910
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2575	60/-45	100	-145/585	190/-125	40/-40	160	695	2285
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2505	55/-50	90	-145/580	185/-120	40/-40	150	615	1925
FLAPS PRIMARY FAIL	VREF20	2705	60/-55	100	-150/605	205/-135	45/-45	175	710	2320
FLAP/SLAT CONTROL	VREF20	2505	55/-50	90	-145/580	185/-120	40/-40	150	615	1925
FLIGHT CONTROL MODE	VREF20	2770	60/-55	105	-155/610	215/-140	45/-45	185	755	2520
HYD PRESS SYS C	VREF20	2705	60/-55	100	-150/605	205/-135	45/-45	175	710	2320
HYD PRESS SYS L+C	VREF30+20	3680	80/-60	135	-215/830	475/-260	60/-60	250	-	1940
HYD PRESS SYS L+R	VREF30+20	5405	90/-55	180	-335/1285	1755/-605	100/-100	345	-	-
HYD PRESS SYS R+C	VREF30+20	3715	85/-65	140	-215/840	485/-265	60/-60	255	-	1995
HYD PRESS SYS L (FLAPS 25)	VREF25	3000	60/-55	110	-190/770	400/-210	50/-50	200	-	1310
HYD PRESS SYS L (FLAPS 30)	VREF30	2840	65/-45	100	-185/755	385/-200	45/-45	200	-	1205
HYD PRESS SYS R (FLAPS 25)	VREF25	2965	55/-55	105	-190/760	390/-205	50/-50	195	-	1265
HYD PRESS SYS R (FLAPS 30)	VREF30	2740	60/-45	100	-185/740	365/-190	45/-45	185	-	1090
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2860	65/-50	110	-150/605	195/-130	45/-45	150	755	2440
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2530	60/-45	90	-145/580	185/-120	35/-35	150	620	1930
PRI FLIGHT COMPUTERS	VREF20	2770	60/-55	105	-155/610	215/-140	45/-45	185	755	2520
SLATS DRIVE	VREF30+30	2715	65/-45	100	-150/595	190/-130	35/-35	150	675	2105
STABILIZER	VREF30+20	2530	60/-45	90	-145/580	185/-120	35/-35	150	620	1930

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	304.9	284.8				
52	126	313.0	291.7				
50	122	321.0	299.0	274.7			
48	118	329.1	307.4	281.2			
46	115	337.3	315.9	288.2	265.3		
44	111	345.2	323.9	295.9	272.2		
42	108	352.5	332.1	304.6	278.8	255.6	
40	104	359.7	340.5	312.9	285.6	261.5	
38	100	366.9	349.0	320.7	292.2	267.2	237.5
36	97	373.4	356.3	327.9	298.5	272.1	242.3
34	93	378.7	363.3	335.4	304.7	276.5	247.0
32	90	378.7	370.4	341.7	310.6	280.5	251.3
30	86	378.7	376.6	347.1	317.1	284.8	255.1
28	82	378.7	376.7	351.7	322.0	289.4	258.9
26	79	378.7	376.8	357.1	325.9	294.0	262.5
24	75	378.7	376.9	357.2	329.0	298.9	266.5
22	72	378.7	377.0	357.3	332.2	302.2	270.7
20	68	378.7	377.1	357.3	332.3	304.3	274.3
18	64	378.7	377.2	357.4	332.4	306.4	276.8
16	61	378.7	377.3	357.5	332.4	306.4	278.6
14	57	378.7	377.3	357.6	332.5	306.5	280.1
12	54	378.7	377.4	357.7	332.6	306.5	280.2
10	50	378.7	377.4	357.7	332.7	306.6	280.3
8	46	378.7	377.5	357.8	332.7	306.6	280.3
6	43	378.7	377.5	357.8	332.8	306.6	280.2
4	40	378.7	377.5	354.6	320.5	293.0	258.9
2	36	378.7	377.6	354.6	320.5	293.0	258.9
0	32	378.7	377.6	354.7	320.6	293.0	259.0
-40	-40	378.7	377.7	354.6	320.6	293.0	259.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1350 kg.
With engine and wing anti-ice on, decrease weight by 2200 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 21950 kg.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	308.4	289.3				
52	126	315.6	296.4				
50	122	323.1	303.4	279.2			
48	118	330.8	310.6	285.8			
46	115	338.7	318.2	292.8	269.5		
44	111	346.3	325.7	300.4	276.4		
42	108	353.7	333.6	308.1	283.2	259.8	
40	104	360.8	341.6	315.5	290.1	265.8	
38	100	368.1	350.1	322.9	297.3	271.8	241.8
36	97	374.8	357.4	329.8	303.3	277.2	246.6
34	93	378.7	364.4	337.1	309.0	281.6	251.3
32	90	378.7	371.7	343.0	314.0	285.9	256.0
30	86	378.7	377.9	348.2	319.8	290.2	259.9
28	82	378.7	378.0	352.9	324.4	295.0	263.8
26	79	378.7	378.2	358.5	328.1	299.6	267.5
24	75	378.7	378.3	358.5	331.1	304.0	271.5
22	72	378.7	378.4	358.6	334.1	307.0	275.9
20	68	378.7	378.5	358.7	334.2	308.7	279.6
18	64	378.7	378.5	358.8	334.3	310.5	282.2
16	61	378.7	378.6	358.8	334.4	310.5	284.1
14	57	378.7	378.7	358.9	334.4	310.6	285.7
12	54	378.7	378.7	359.0	334.5	310.7	285.7
10	50	378.7	378.7	359.1	334.6	310.7	285.8
8	46	378.7	378.7	359.1	334.7	310.7	285.8
6	43	378.7	378.7	359.2	334.7	310.8	285.8
4	40	378.7	378.7	359.2	334.8	310.8	280.7
2	36	378.7	378.7	359.3	334.8	310.8	280.7
0	32	378.7	378.7	359.3	334.8	310.9	280.7
-40	-40	378.7	378.7	359.4	334.9	311.0	280.9

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1450 kg.
With engine and wing anti-ice on, decrease weight by 1800 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 22250 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
360	0	22.1	24.1	26.5	32.9	36.3	40.3	46.1	51.3	57.3	60.4	67.5	75.8	75.7	84.9	95.4	91.6	102.6	115.1
	10	22.7	24.8	27.2	33.9	37.4	41.5	47.5	52.9	59.1	62.3	69.7	78.2	78.1	87.6	98.4	94.4	105.7	118.4
	15	23.2	25.3	27.8	34.5	38.1	42.3	48.4	53.9	60.2	63.4	70.9	79.6	79.5	89.1	100.0	96.0	107.5	120.3
	20	23.6	25.7	28.2	35.1	38.8	43.0	49.3	54.8	61.2	64.5	72.1	80.9	80.8	90.6	101.7	97.6	109.2	122.2
	30	24.1	26.3	28.9	36.0	39.8	44.1	50.5	56.3	62.9	66.3	74.1	83.2	83.1	93.1	104.4	100.3	112.1	125.4
	40	24.3	26.5	29.2	36.4	40.3	44.7	51.3	57.2	64.0	67.4	75.5	84.8	84.7	94.9	106.5	102.3	114.3	127.7
340	0	21.2	23.1	25.3	31.4	34.7	38.4	43.9	48.8	54.5	57.5	64.2	72.0	72.1	80.8	90.8	87.3	97.9	109.9
	10	21.7	23.7	26.0	32.4	35.7	39.5	45.3	50.4	56.2	59.3	66.3	74.3	74.4	83.4	93.7	90.0	100.9	113.1
	15	22.1	24.1	26.5	33.0	36.3	40.3	46.1	51.3	57.3	60.4	67.5	75.7	75.7	84.8	95.3	91.6	102.6	115.0
	20	22.5	24.6	26.9	33.6	37.0	41.0	46.9	52.2	58.3	61.4	68.6	77.0	77.0	86.3	96.8	93.1	104.2	116.8
	30	23.1	25.1	27.6	34.4	37.9	42.0	48.2	53.6	59.8	63.1	70.5	79.1	79.1	88.7	99.5	95.7	107.1	119.9
	40	23.2	25.3	27.8	34.8	38.4	42.6	48.9	54.4	60.8	64.2	71.8	80.6	80.6	90.4	101.5	97.6	109.2	122.2
320	0	20.2	22.0	24.1	30.0	33.0	36.5	41.8	46.4	51.7	54.6	60.9	68.3	68.4	76.7	86.1	82.9	93.0	104.4
	10	20.8	22.6	24.8	30.8	33.9	37.6	43.1	47.8	53.3	56.3	62.9	70.4	70.6	79.1	88.9	85.5	95.9	107.6
	15	21.2	23.0	25.2	31.4	34.6	38.3	43.8	48.7	54.3	57.3	64.0	71.7	71.9	80.5	90.4	87.0	97.5	109.4
	20	21.5	23.4	25.7	32.0	35.2	38.9	44.6	49.5	55.3	58.3	65.1	72.9	73.1	81.9	91.9	88.5	99.1	111.1
	30	22.0	24.0	26.3	32.7	36.1	39.9	45.8	50.9	56.7	59.9	66.9	74.9	75.1	84.1	94.4	90.9	101.8	114.1
	40	22.1	24.1	26.5	33.1	36.5	40.4	46.4	51.6	57.7	60.9	68.1	76.3	76.5	85.8	96.3	92.7	103.9	116.3
300	0	19.3	20.9	22.9	28.5	31.3	34.6	39.6	43.9	48.9	51.6	57.6	64.5	64.7	72.5	81.4	78.4	88.0	98.8
	10	19.8	21.5	23.5	29.3	32.2	35.6	40.8	45.3	50.4	53.2	59.4	66.5	66.8	74.8	84.0	80.9	90.7	101.9
	15	20.2	21.9	24.0	29.8	32.8	36.3	41.6	46.1	51.4	54.2	60.5	67.7	68.0	76.1	85.4	82.3	92.3	103.6
	20	20.5	22.3	24.4	30.4	33.4	36.9	42.3	46.9	52.3	55.1	61.5	68.9	69.1	77.4	86.9	83.7	93.8	105.3
	30	21.0	22.8	25.0	31.1	34.2	37.8	43.4	48.1	53.6	56.6	63.2	70.8	71.0	79.5	89.3	86.1	96.4	108.1
	40	21.1	22.9	25.1	31.4	34.6	38.3	44.0	48.8	54.5	57.5	64.3	72.1	72.3	81.1	91.0	87.7	98.3	110.3
260	0	17.4	18.9	20.6	25.5	28.0	30.8	35.3	39.0	43.3	45.7	50.8	56.8	57.1	63.8	71.6	69.2	77.5	87.1
	10	17.9	19.4	21.2	26.3	28.8	31.7	36.3	40.1	44.6	47.1	52.4	58.6	58.9	65.8	73.8	71.4	80.0	89.8
	15	18.2	19.8	21.6	26.7	29.3	32.3	37.0	40.9	45.4	48.0	53.4	59.6	60.0	67.0	75.2	72.6	81.4	91.4
	20	18.6	20.1	21.9	27.2	29.8	32.9	37.6	41.6	46.2	48.8	54.3	60.7	61.0	68.2	76.4	73.9	82.7	92.9
	30	19.0	20.6	22.4	27.9	30.5	33.7	38.6	42.7	47.4	50.1	55.7	62.3	62.7	70.1	78.6	75.9	85.0	95.4
	40	19.0	20.7	22.6	28.1	30.8	34.0	39.0	43.2	48.1	50.8	56.6	63.4	63.7	71.3	80.0	77.3	86.7	97.3
220	0	15.7	16.9	18.4	22.6	24.7	27.1	30.9	34.0	37.6	39.7	44.0	49.0	49.3	54.9	61.4	59.4	66.5	74.6
	10	16.1	17.4	18.9	23.2	25.4	27.9	31.8	35.0	38.8	40.9	45.3	50.5	50.8	56.6	63.4	61.3	68.6	77.0
	15	16.4	17.7	19.2	23.7	25.8	28.4	32.4	35.6	39.5	41.6	46.2	51.4	51.7	57.6	64.5	62.4	69.8	78.3
	20	16.7	18.0	19.6	24.1	26.3	28.9	32.9	36.3	40.2	42.3	47.0	52.3	52.6	58.6	65.6	63.5	71.0	79.7
	30	17.0	18.4	20.0	24.6	26.9	29.6	33.7	37.2	41.2	43.4	48.2	53.7	54.0	60.2	67.4	65.2	73.0	81.9
	40	17.1	18.4	20.1	24.8	27.1	29.9	34.1	37.6	41.7	44.0	48.9	54.6	54.9	61.2	68.6	66.4	74.3	83.4
180	0	13.9	15.0	16.2	19.7	21.4	23.4	26.5	29.0	32.0	33.6	37.0	41.1	41.2	45.7	50.9	49.3	54.9	61.5
	10	14.3	15.4	16.6	20.2	22.0	24.1	27.2	29.9	32.9	34.5	38.1	42.3	42.4	47.1	52.5	50.8	56.7	63.4
	15	14.6	15.7	16.9	20.6	22.4	24.5	27.7	30.4	33.6	35.2	38.8	43.1	43.2	48.0	53.5	51.8	57.7	64.5
	20	14.8	15.9	17.2	21.0	22.8	25.0	28.2	30.9	34.1	35.8	39.5	43.9	44.0	48.8	54.4	52.7	58.7	65.7
	30	15.1	16.3	17.6	21.5	23.3	25.5	28.9	31.7	35.0	36.7	40.5	45.0	45.1	50.1	55.9	54.1	60.3	67.5
	40	15.1	16.3	17.7	21.6	23.5	25.7	29.1	32.0	35.4	37.1	41.1	45.6	45.7	50.9	56.8	54.9	61.3	68.7

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	4.4	14.1	23.7	33.2	42.6	51.9	61.2	70.5	79.9	89.3	98.9	108.7
	MAX AUTO	4.4	13.1	21.7	30.2	38.7	47.3	56.0	65.0	74.3	83.9	94.0	104.6
	AUTOBRAKE 4	4.3	12.5	20.4	28.1	35.7	43.4	51.2	59.3	67.7	76.6	86.1	96.4
	AUTOBRAKE 3	4.2	11.9	19.2	26.3	33.3	40.3	47.4	54.8	62.6	70.8	79.7	89.3
	AUTOBRAKE 2	4.1	11.2	17.9	24.4	30.8	37.2	43.7	50.5	57.6	65.1	73.2	81.9
	AUTOBRAKE 1	4.0	10.3	16.3	22.1	27.8	33.4	39.1	45.1	51.3	58.0	65.1	72.9

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.3	12.0	21.0	30.0	38.9	47.5	56.1	64.5	72.8	81.0	89.2	97.5
	MAX AUTO	2.0	8.7	15.5	22.3	29.3	36.4	43.8	51.5	59.6	68.3	77.5	87.4
	AUTOBRAKE 4	1.4	5.6	10.4	15.6	20.9	26.4	32.2	38.3	44.8	51.9	59.6	68.0
	AUTOBRAKE 3	0.9	3.2	6.4	10.3	14.3	18.5	23.0	27.9	33.2	39.0	45.4	52.4
	AUTOBRAKE 2	0.3	1.8	4.0	6.5	9.3	12.3	15.6	19.2	23.3	27.9	33.0	38.7
	AUTOBRAKE 1	0.2	1.2	2.6	4.3	6.1	8.1	10.3	12.8	15.6	18.8	22.3	26.4

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

Intentionally
Blank

ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for one pack on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100.0	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off
16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.1	102.0	102.8	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	300	17500	16300	15100
340	330	292	19000	17800	16600
320	311	284	20400	19400	18300
300	292	275	21600	20800	19900
280	272	266	23300	22300	21300
260	252	257	25300	24400	23100
240	232	247	27500	26700	25300
220	214	237	29900	29200	27900
200	194	226	31700	31300	30500
180	175	215	33600	33400	33000
160	155	203	35800	35700	35600

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
134	126	118	111	105	100	95	90	86	82	79
269	251	236	222	210	200	190	181	173	165	159
403	377	354	334	316	300	285	272	260	248	238
536	502	472	445	421	400	380	362	346	332	318
670	627	589	556	526	500	475	453	433	415	398
803	752	707	667	632	600	571	544	520	498	478
936	877	824	778	737	700	666	635	607	582	558
1068	1001	942	889	842	800	761	726	695	665	639
1201	1126	1059	1000	947	900	856	817	782	749	719
1333	1250	1176	1111	1052	1000	952	908	869	833	799
1466	1374	1293	1222	1157	1100	1047	1000	956	916	880
1598	1499	1411	1332	1262	1200	1142	1091	1043	1000	960
1731	1623	1528	1443	1368	1300	1238	1182	1131	1084	1040
1863	1747	1645	1554	1473	1400	1333	1273	1218	1167	1121
1996	1872	1762	1665	1578	1500	1428	1364	1305	1251	1201
2129	1997	1880	1776	1683	1600	1524	1455	1392	1334	1281
2262	2121	1997	1887	1788	1700	1619	1546	1479	1418	1361
2395	2246	2115	1998	1894	1800	1714	1637	1566	1501	1441

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	160	180	200	220	240	260	280	300	320	340	360	
100	1.1	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.8	1.9	2.0	0:16
200	2.4	2.5	2.8	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.6	0:31
300	3.7	4.1	4.5	4.9	5.3	5.6	6.0	6.3	6.6	7.0	7.4	0:46
400	5.1	5.6	6.2	6.8	7.3	7.8	8.2	8.7	9.2	9.7	10.3	1:01
500	6.4	7.0	7.8	8.5	9.2	9.8	10.4	11.0	11.6	12.3	13.0	1:16
600	7.7	8.4	9.3	10.1	11.0	11.7	12.5	13.2	13.9	14.8	15.6	1:31
700	8.9	9.8	10.8	11.8	12.8	13.7	14.5	15.4	16.2	17.2	18.2	1:46
800	10.1	11.2	12.3	13.4	14.5	15.6	16.5	17.5	18.5	19.6	20.8	2:01
900	11.3	12.5	13.8	15.1	16.3	17.4	18.5	19.6	20.7	22.0	23.3	2:15
1000	12.6	13.9	15.3	16.7	18.0	19.3	20.5	21.8	23.0	24.4	25.9	2:30
1100	13.8	15.2	16.8	18.3	19.8	21.2	22.5	23.9	25.2	26.8	28.4	2:45
1200	14.9	16.6	18.2	19.9	21.5	23.0	24.5	26.0	27.4	29.2	30.9	2:59
1300	16.1	17.9	19.7	21.5	23.2	24.8	26.4	28.0	29.7	31.5	33.4	3:14
1400	17.3	19.2	21.1	23.0	24.9	26.6	28.4	30.1	31.8	33.8	35.8	3:29
1500	18.5	20.5	22.5	24.6	26.5	28.4	30.3	32.2	34.0	36.1	38.3	3:43
1600	19.6	21.7	23.9	26.1	28.2	30.2	32.2	34.2	36.2	38.4	40.7	3:58
1700	20.8	23.0	25.3	27.6	29.8	32.0	34.1	36.2	38.3	40.7	43.1	4:13
1800	21.9	24.3	26.7	29.1	31.5	33.8	36.0	38.2	40.5	43.0	45.5	4:28

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	15000	13600	12000
350	15500	14200	12600
340	16400	14900	13100
330	17200	15700	13900
320	18100	16600	14900
310	19000	17500	15800
300	19900	18400	16700
290	20600	19400	17800
280	21200	20200	18800
270	21900	20900	19900
260	22800	21600	20600
250	23800	22500	21400
240	24900	23700	22100
230	26200	24900	23400
220	27600	26300	24600
210	29100	27700	26000
200	30400	29100	27600
190	31400	30500	29100
180	32400	31700	30600
170	33400	33000	32000
160	34600	34400	33500

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Altitude Capability

Max Continuous Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	16000	14700	13100
350	16600	15300	13800
340	17200	15800	14400
330	17700	16400	15000
320	18300	16900	15600
310	18900	17500	16100
300	19500	18100	16600
290	20000	18600	17200
280	20400	19200	17700
270	20800	19700	18300
260	21100	20200	18900
250	21500	20500	19500
240	21800	20900	20000
230	22300	21200	20300
220	22700	21500	20600
210	23200	21800	20900
200	23600	22200	21200
190	24000	22500	21400
180	24300	22900	21600
170	24700	23200	21800
160	25000	23500	22000

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 200 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	91.6	97.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10335	11118								
340	%N1	90.6	95.5	98.6							
	MACH	.602	.662	.681							
	KIAS	334	337	333							
	FF/ENG	9977	10586	10771							
320	%N1	89.7	93.7	95.9	99.2						
	MACH	.602	.650	.667	.686						
	KIAS	334	330	326	323						
	FF/ENG	9633	9884	9949	10098						
300	%N1	87.7	92.0	93.7	96.1						
	MACH	.584	.637	.653	.671						
	KIAS	324	323	319	316						
	FF/ENG	8949	9222	9239	9287						
280	%N1	85.7	90.1	91.8	93.5	96.3					
	MACH	.566	.619	.640	.656	.674					
	KIAS	314	314	312	308	305					
	FF/ENG	8313	8533	8592	8583	8659					
260	%N1	83.8	88.1	89.8	91.5	93.2	96.3				
	MACH	.548	.599	.621	.642	.658	.677				
	KIAS	304	303	303	301	297	294				
	FF/ENG	7698	7830	7916	7948	7953	8065				
240	%N1	81.5	85.7	87.6	89.3	91.0	92.9	96.0			
	MACH	.529	.577	.599	.622	.643	.659	.678			
	KIAS	293	292	292	292	290	286	283			
	FF/ENG	7105	7147	7227	7288	7324	7345	7467			
220	%N1	79.3	83.3	85.1	86.9	88.7	90.4	92.3	95.4	99.4	
	MACH	.510	.555	.576	.598	.621	.642	.659	.679	.701	
	KIAS	282	280	280	280	280	278	274	271	269	
	FF/ENG	6519	6489	6557	6617	6672	6717	6737	6844	7112	
200	%N1	76.7	80.6	82.5	84.2	86.1	87.8	89.6	91.5	94.5	98.6
	MACH	.490	.532	.552	.572	.594	.618	.640	.658	.677	.700
	KIAS	271	269	268	267	267	267	266	262	259	257
	FF/ENG	5935	5852	5910	5967	6007	6064	6109	6120	6208	6468
180	%N1	74.1	77.8	79.6	81.5	83.1	85.0	86.7	88.5	90.3	93.3
	MACH	.470	.509	.527	.546	.567	.589	.613	.636	.654	.674
	KIAS	260	256	255	255	254	254	254	253	250	247
	FF/ENG	5363	5237	5285	5340	5374	5402	5453	5494	5502	5567
160	%N1	71.2	74.8	76.6	78.3	80.1	81.7	83.6	85.3	87.1	88.9
	MACH	.449	.485	.501	.519	.538	.559	.581	.605	.629	.649
	KIAS	248	244	243	242	241	241	240	240	240	237
	FF/ENG	4809	4648	4682	4735	4758	4774	4797	4837	4878	4892

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
286	264	244	227	213	200	190	181	173	166	159
569	525	487	454	425	400	381	364	348	333	320
853	788	730	681	638	600	572	546	522	501	482
1138	1051	974	908	851	800	763	729	698	669	643
1424	1316	1219	1136	1064	1000	954	911	872	836	803
1711	1580	1464	1364	1278	1200	1144	1093	1046	1003	964
1999	1846	1709	1592	1491	1400	1335	1275	1220	1170	1124
2288	2111	1954	1820	1704	1600	1526	1457	1394	1337	1285
2578	2378	2201	2049	1918	1800	1717	1639	1568	1504	1445
2869	2646	2447	2278	2132	2000	1907	1821	1742	1670	1605

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	4.0	0:39	3.5	0:38	3.2	0:36	2.8	0:36	2.6	0:35
400	8.4	1:15	7.6	1:11	7.1	1:08	6.7	1:06	6.4	1:03
600	12.7	1:50	11.7	1:45	11.1	1:40	10.4	1:36	10.2	1:32
800	16.9	2:26	15.7	2:19	14.9	2:11	14.2	2:06	13.9	2:02
1000	21.1	3:02	19.7	2:53	18.8	2:44	17.9	2:37	17.6	2:31
1200	25.3	3:38	23.7	3:27	22.6	3:16	21.5	3:07	21.2	3:00
1400	29.4	4:15	27.6	4:02	26.3	3:49	25.1	3:38	24.7	3:30
1600	33.5	4:52	31.4	4:37	30.1	4:21	28.7	4:09	28.2	4:00
1800	37.6	5:29	35.2	5:12	33.8	4:55	32.3	4:40	31.6	4:29
2000	41.6	6:07	39.0	5:47	37.4	5:28	35.8	5:11	35.0	5:00

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
5	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.2	1.7	2.3
10	-1.8	-1.3	-0.9	-0.4	0.0	0.8	1.6	2.6	3.7	4.9
15	-2.7	-2.0	-1.3	-0.7	0.0	1.2	2.5	4.0	5.6	7.4
20	-3.7	-2.7	-1.8	-0.9	0.0	1.6	3.3	5.3	7.5	9.8
25	-4.6	-3.4	-2.3	-1.1	0.0	2.0	4.2	6.6	9.3	12.2
30	-5.6	-4.2	-2.7	-1.4	0.0	2.3	4.9	7.8	11.0	14.4
35	-6.5	-4.9	-3.2	-1.6	0.0	2.7	5.7	9.0	12.6	16.6
40	-7.5	-5.6	-3.7	-1.8	0.0	3.1	6.4	10.2	14.2	18.6
45	-8.5	-6.3	-4.2	-2.1	0.0	3.4	7.1	11.3	15.8	20.6

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

320 KIAS Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
279	259	241	226	212	200	191	182	174	167	161
554	515	480	450	424	400	383	367	352	338	326
829	771	720	675	636	600	575	551	529	509	490
1103	1027	958	899	847	800	766	735	706	679	655
1378	1283	1198	1124	1059	1000	958	919	883	850	820
1652	1539	1437	1348	1270	1200	1150	1103	1060	1020	984
1927	1795	1676	1573	1482	1400	1342	1288	1237	1191	1149
2202	2051	1915	1798	1694	1600	1534	1472	1415	1362	1313
2476	2306	2154	2022	1905	1800	1725	1656	1591	1532	1478
2751	2563	2393	2247	2117	2000	1917	1840	1769	1703	1643

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	4.1	0:37	3.6	0:36	3.2	0:35	2.9	0:34	2.8	0:33
400	8.5	1:10	7.9	1:07	7.3	1:04	6.9	1:01	6.9	0:59
600	13.0	1:42	12.1	1:38	11.4	1:33	10.9	1:29	10.9	1:24
800	17.3	2:15	16.4	2:08	15.5	2:02	14.8	1:56	14.9	1:50
1000	21.7	2:48	20.6	2:39	19.5	2:31	18.7	2:23	18.9	2:16
1200	26.0	3:20	24.7	3:10	23.5	3:00	22.6	2:51	22.8	2:42
1400	30.3	3:53	28.9	3:41	27.5	3:29	26.5	3:18	26.7	3:08
1600	34.6	4:26	33.0	4:12	31.4	3:58	30.3	3:45	30.6	3:33
1800	38.9	4:58	37.1	4:42	35.4	4:27	34.1	4:13	34.4	3:59
2000	43.1	5:31	41.2	5:13	39.3	4:56	37.9	4:40	38.2	4:25

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
5	-0.3	-0.3	-0.2	-0.1	0.0	0.2	0.5	0.8	1.3	1.7
10	-0.7	-0.6	-0.5	-0.2	0.0	0.5	1.1	1.9	2.7	3.7
15	-1.1	-0.9	-0.7	-0.4	0.0	0.8	1.8	2.9	4.2	5.6
20	-1.5	-1.2	-0.9	-0.5	0.0	1.1	2.3	3.8	5.5	7.4
25	-1.8	-1.5	-1.1	-0.6	0.0	1.3	2.9	4.7	6.8	9.1
30	-2.1	-1.8	-1.3	-0.7	0.0	1.6	3.4	5.6	8.0	10.7
35	-2.4	-2.0	-1.5	-0.8	0.0	1.8	3.9	6.4	9.1	12.2
40	-2.7	-2.3	-1.7	-0.9	0.0	2.0	4.4	7.1	10.2	13.6
45	-3.0	-2.5	-1.8	-1.0	0.0	2.2	4.9	7.8	11.2	14.9

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	81.1	84.5	89.2	94.5			
	KIAS	272	273	275	298			
	FF/ENG	9270	9350	9640	10310			
340	%N1	79.3	82.6	87.4	92.2			
	KIAS	264	266	267	282			
	FF/ENG	8720	8760	8990	9410			
320	%N1	77.6	80.6	85.4	90.1	98.4		
	KIAS	257	257	259	265	294		
	FF/ENG	8170	8190	8350	8590	9780		
300	%N1	75.6	78.6	83.4	88.1	94.5		
	KIAS	249	249	251	252	277		
	FF/ENG	7640	7640	7740	7890	8730		
280	%N1	73.7	76.6	81.1	86.0	91.3		
	KIAS	240	241	242	243	258		
	FF/ENG	7120	7090	7150	7250	7830		
260	%N1	71.6	74.5	78.8	83.7	88.8	97.3	
	KIAS	232	232	233	234	240	266	
	FF/ENG	6600	6570	6570	6640	7030	7980	
240	%N1	69.3	72.3	76.5	81.3	86.3	92.6	
	KIAS	226	226	226	226	226	248	
	FF/ENG	6090	6060	6040	6080	6360	6920	
220	%N1	67.0	69.9	74.1	78.6	83.8	88.8	99.1
	KIAS	220	220	220	220	220	226	246
	FF/ENG	5600	5570	5530	5540	5750	6060	7020
200	%N1	64.7	67.4	71.6	76.0	80.9	85.8	93.5
	KIAS	213	213	213	213	213	213	233
	FF/ENG	5130	5090	5030	5040	5180	5360	5950
180	%N1	62.2	64.8	68.9	73.2	77.9	83.0	88.0
	KIAS	206	206	206	206	206	206	208
	FF/ENG	4670	4620	4560	4560	4640	4780	5000
160	%N1	59.5	62.1	65.9	70.3	74.7	79.8	84.5
	KIAS	199	199	199	199	199	199	199
	FF/ENG	4230	4170	4110	4100	4150	4230	4360

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	450	340				
50	500	390	230			
48	550	440	290			
46	590	490	340	180		
44	640	550	390	230		
42	690	590	430	270	110	
40	730	640	480	310	140	
38	760	690	530	350	170	
36	760	730	560	390	200	-10
34	760	780	600	420	230	20
32	770	780	630	460	260	50
30	770	790	660	480	300	70
20	790	800	670	530	370	190
10	810	820	620	440	280	140
0	830	830	610	380	150	-90
-20	860	870	630	390	150	-90
-40	900	900	660	410	160	-100

Rate of climb capability shown is valid for 225000 kg, gear down at VREF20 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 225000 kg.
Increase rate of climb 50 ft/min per 5000 kg less than 225000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-120	-230				
50	-80	-190	-340			
48	-40	-140	-300			
46	10	-100	-250	-400		
44	50	-50	-200	-360		
42	90	-10	-160	-320	-480	
40	120	40	-130	-290	-450	
38	160	80	-90	-260	-430	
36	160	120	-50	-230	-400	-600
34	160	150	-20	-190	-380	-580
32	160	170	10	-160	-350	-560
30	160	170	30	-140	-320	-530
20	170	170	40	-100	-250	-440
10	180	180	20	-130	-280	-640
0	180	180	-30	-250	-480	-710
-20	190	190	-40	-260	-490	-730
-40	200	190	-40	-280	-510	-760

Rate of climb capability shown is valid for 225000 kg, gear down at VREF30 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 225000 kg.
Increase rate of climb 50 ft/min per 5000 kg less than 225000 kg.

Intentionally
Blank

ALTERNATE MODE EEC

Alternate Mode EEC Max Takeoff %N1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (1000 FT)											
°C	°F	-2	-1	0	1	2	3	4	5	6	7	8	8.4
55	131	94.3	96.7	97.0	96.7	96.5	96.6	96.4	96.3	96.1	95.5	94.6	94.2
50	122	95.7	98.1	98.6	98.2	97.9	97.9	97.8	97.6	97.4	96.8	95.9	95.6
45	113	97.2	99.6	100.1	99.8	99.4	99.3	99.1	98.9	98.8	98.2	97.3	96.9
40	104	98.9	101.2	101.9	101.4	101.0	100.8	100.6	100.4	100.0	99.4	98.6	98.2
35	95	100.9	102.7	104.7	104.2	103.1	102.6	102.1	101.7	101.1	100.4	99.6	99.3
30	86	100.5	103.7	106.9	106.4	105.6	105.0	104.3	103.7	102.6	101.5	100.7	100.3
25	77	99.7	102.8	106.0	106.7	107.3	107.2	106.7	106.5	105.3	103.8	102.4	101.8
20	68	98.8	101.9	105.1	105.8	106.4	106.8	107.1	107.5	106.8	105.9	104.8	104.3
15	59	98.0	101.1	104.2	104.9	105.5	105.8	106.2	106.5	106.4	106.1	105.6	105.3
10	50	97.1	100.2	103.3	104.0	104.6	104.9	105.3	105.6	105.5	105.2	104.9	104.8
5	41	96.3	99.3	102.4	103.0	103.7	104.0	104.3	104.7	104.5	104.2	104.0	103.8
0	32	95.4	98.4	101.4	102.1	102.7	103.1	103.4	103.7	103.6	103.3	103.0	102.9
-10	14	93.6	96.6	99.6	100.2	100.8	101.2	101.5	101.8	101.7	101.4	101.1	101.0
-20	-4	91.8	94.7	97.7	98.3	98.9	99.2	99.5	99.9	99.7	99.5	99.2	99.0
-30	-22	90.0	92.8	95.7	96.3	96.9	97.2	97.5	97.9	97.7	97.5	97.2	97.1
-40	-40	88.1	90.9	93.7	94.3	94.9	95.2	95.5	95.8	95.7	95.4	95.2	95.0
-50	-58	86.2	88.9	91.7	92.3	92.9	93.1	93.4	93.8	93.6	93.4	93.1	93.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)											
	-2	-1	0	1	2	3	4	5	6	7	8	8.4
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Intentionally
Blank

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

***Packs on or off with 2 bleed sources.**
****Packs off with 1 bleed source.**

GEAR DOWN

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18200	16100	13700
350	18800	16900	14400
340	19400	17600	15100
330	20000	18200	15800
320	20700	19100	16800
310	21800	20300	18000
300	22800	21400	19300
290	24000	22500	20600
280	25100	23700	22000
270	26200	24800	23300
260	27300	26100	24600
250	28500	27500	26000
240	29700	28900	27400
230	30600	30200	28900
220	31400	31100	30300
210	32300	32000	31400
200	33200	33000	32500
190	34100	34000	33700
180	35000	34900	34800
170	36000	36000	35800
160	37000	37000	36800

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.7	89.1	91.1	93.6						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7616	7771	7912	8126						
340	%N1	83.8	88.1	90.0	92.2						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7360	7485	7589	7762						
320	%N1	82.6	86.9	88.8	90.8	93.3					
	MACH	.483	.531	.552	.574	.597					
	KIAS	267	268	268	268	269					
	FF/ENG	7053	7156	7240	7378	7571					
300	%N1	80.5	84.9	87.0	88.8	90.8	93.8				
	MACH	.468	.514	.535	.556	.579	.603				
	KIAS	259	259	259	260	260	260				
	FF/ENG	6575	6634	6706	6789	6934	7132				
280	%N1	78.4	82.9	85.0	86.8	88.6	90.7	94.0			
	MACH	.453	.498	.517	.538	.560	.584	.609			
	KIAS	250	251	251	251	251	252	252			
	FF/ENG	6101	6136	6179	6258	6335	6478	6688			
260	%N1	76.2	80.7	82.7	84.7	86.4	88.3	90.4	94.0		
	MACH	.437	.481	.500	.520	.541	.563	.587	.613		
	KIAS	242	242	242	242	242	242	243	243		
	FF/ENG	5630	5659	5680	5728	5802	5878	6014	6228		
240	%N1	73.8	78.3	80.3	82.3	84.2	85.9	87.8	90.0	93.8	
	MACH	.421	.463	.481	.500	.520	.542	.565	.589	.615	
	KIAS	233	232	233	233	233	233	233	234	234	
	FF/ENG	5171	5184	5206	5227	5275	5340	5416	5541	5751	
220	%N1	71.4	75.8	77.7	79.7	81.6	83.5	85.3	87.1	89.4	93.4
	MACH	.404	.444	.461	.480	.499	.520	.542	.565	.590	.617
	KIAS	223	223	223	223	223	223	223	224	224	225
	FF/ENG	4720	4715	4736	4756	4775	4819	4878	4949	5062	5264
200	%N1	68.7	73.1	75.0	76.9	78.9	80.8	82.7	84.4	86.3	88.6
	MACH	.387	.425	.442	.460	.479	.498	.519	.541	.564	.589
	KIAS	213	213	213	213	213	213	213	213	213	214
	FF/ENG	4284	4281	4290	4310	4323	4339	4375	4426	4480	4578
180	%N1	66.3	70.8	72.6	74.5	76.5	78.5	80.2	82.2	83.9	85.7
	MACH	.374	.412	.428	.445	.463	.482	.503	.524	.546	.570
	KIAS	206	206	206	206	206	206	206	206	206	206
	FF/ENG	3937	3935	3933	3945	3959	3969	3984	4021	4066	4112
160	%N1	64.0	68.2	70.1	71.9	74.0	75.9	77.7	79.5	81.4	83.1
	MACH	.361	.397	.413	.429	.447	.465	.485	.505	.527	.550
	KIAS	199	199	199	199	199	199	199	199	199	199
	FF/ENG	3592	3585	3584	3585	3591	3602	3612	3628	3663	3702

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
316	284	257	235	216	200	189	180	171	162	155
634	570	515	470	433	400	379	359	341	326	312
956	859	774	706	650	600	568	539	512	489	468
1282	1149	1035	943	867	800	757	718	683	651	623
1610	1442	1297	1180	1084	1000	947	898	853	813	778
1942	1737	1560	1419	1302	1200	1136	1077	1024	976	933
2276	2034	1825	1658	1520	1400	1325	1256	1193	1137	1087
2614	2333	2091	1898	1739	1600	1514	1434	1362	1298	1241
2954	2634	2358	2138	1958	1800	1702	1613	1531	1459	1394
3297	2936	2626	2379	2176	2000	1891	1791	1701	1619	1547
3642	3240	2894	2620	2396	2200	2080	1969	1869	1780	1700
3991	3546	3164	2862	2615	2400	2268	2147	2037	1939	1852
4342	3853	3435	3104	2835	2600	2456	2324	2205	2098	2004
4697	4164	3707	3347	3055	2800	2644	2502	2373	2258	2156
5054	4476	3981	3591	3275	3000	2832	2679	2541	2416	2307
5414	4789	4255	3836	3495	3200	3020	2856	2708	2575	2458
5778	5105	4531	4081	3716	3400	3208	3033	2875	2734	2609
6146	5424	4808	4326	3937	3600	3396	3210	3041	2891	2759
6516	5744	5086	4572	4159	3800	3584	3386	3208	3049	2909
6889	6066	5365	4819	4380	4000	3772	3564	3375	3207	3059

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10 FUEL (1000 KG)	10 TIME (HR:MIN)	14 FUEL (1000 KG)	14 TIME (HR:MIN)	20 FUEL (1000 KG)	20 TIME (HR:MIN)	24 FUEL (1000 KG)	24 TIME (HR:MIN)	28 FUEL (1000 KG)	28 TIME (HR:MIN)
200	7.4	0:47	6.7	0:45	5.9	0:42	5.5	0:40	5.2	0:39
400	15.0	1:32	13.9	1:27	12.6	1:21	11.9	1:16	11.5	1:12
600	22.6	2:17	21.1	2:10	19.3	1:59	18.3	1:52	17.7	1:46
800	29.9	3:04	28.1	2:53	25.7	2:39	24.5	2:29	23.7	2:20
1000	37.3	3:50	35.0	3:37	32.1	3:18	30.6	3:06	29.7	2:55
1200	44.3	4:38	41.7	4:22	38.3	3:59	36.6	3:44	35.4	3:30
1400	51.4	5:27	48.4	5:07	44.5	4:40	42.5	4:22	41.2	4:06
1600	58.2	6:16	54.8	5:53	50.5	5:21	48.2	5:01	46.7	4:42
1800	65.0	7:05	61.3	6:39	56.5	6:03	53.9	5:40	52.2	5:19
2000	71.6	7:55	67.5	7:26	62.3	6:46	59.5	6:20	57.5	5:56
2200	78.1	8:46	73.8	8:14	68.1	7:28	65.0	7:00	62.8	6:33
2400	84.5	9:37	79.8	9:02	73.8	8:11	70.3	7:40	68.0	7:10
2600	90.8	10:29	85.9	9:50	79.4	8:55	75.7	8:20	73.1	7:48
2800	97.0	11:22	91.7	10:39	84.8	9:39	80.9	9:02	78.1	8:26
3000	103.1	12:15	97.5	11:28	90.2	10:23	86.1	9:43	83.0	9:05
3200	109.0	13:09	103.2	12:18	95.5	11:08	91.1	10:25	87.8	9:44
3400	114.9	14:03	108.8	13:09	100.8	11:53	96.1	11:07	92.7	10:23
3600	120.6	14:58	114.3	14:00	105.9	12:39	101.0	11:49	97.3	11:02
3800	126.4	15:53	119.7	14:51	111.0	13:25	105.8	12:32	102.0	11:42
4000	132.0	16:50	125.0	15:44	115.9	14:12	110.6	13:15	106.5	12:22

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
10	-1.7	-1.3	-0.9	-0.4	0.0	1.0	2.0	3.1	4.2	5.5
20	-3.6	-2.7	-1.8	-0.9	0.0	1.7	3.7	5.8	8.1	10.7
30	-5.5	-4.1	-2.8	-1.4	0.0	2.5	5.3	8.4	11.8	15.5
40	-7.3	-5.5	-3.7	-1.8	0.0	3.2	6.7	10.7	15.1	19.9
50	-9.1	-6.9	-4.6	-2.3	0.0	3.8	8.1	12.9	18.2	24.0
60	-10.8	-8.2	-5.5	-2.8	0.0	4.4	9.4	14.9	21.0	27.6
70	-12.5	-9.5	-6.4	-3.2	0.0	5.0	10.5	16.7	23.5	30.9
80	-14.2	-10.8	-7.3	-3.7	0.0	5.5	11.6	18.3	25.7	33.7
90	-15.9	-12.1	-8.1	-4.1	0.0	5.9	12.5	19.7	27.6	36.2
100	-17.5	-13.3	-9.0	-4.5	0.0	6.3	13.3	21.0	29.3	38.3
110	-19.1	-14.6	-9.8	-4.9	0.0	6.7	14.0	22.0	30.7	40.0
120	-20.6	-15.8	-10.7	-5.4	0.0	7.0	14.6	22.9	31.8	41.4
130	-22.1	-16.9	-11.5	-5.8	0.0	7.2	15.1	23.5	32.6	42.3
140	-23.5	-18.1	-12.3	-6.2	0.0	7.4	15.5	24.0	33.2	42.9

Descent at VREF30+80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	39	43	48	52	56	60	64	69	73
TIME (MINUTES)	11	12	12	13	14	15	15	16	17	17

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.2						
	KIAS	262						
	FF/ENG	7790						
340	%N1	75.0	78.1					
	KIAS	260	260					
	FF/ENG	7470	7470					
320	%N1	73.3	76.3					
	KIAS	253	253					
	FF/ENG	7010	7000					
300	%N1	71.2	74.3	78.7				
	KIAS	244	244	244				
	FF/ENG	6510	6490	6470				
280	%N1	69.2	72.5	76.8				
	KIAS	238	238	238				
	FF/ENG	6080	6070	6040				
260	%N1	67.4	70.5	74.9	79.5			
	KIAS	232	232	232	232			
	FF/ENG	5680	5680	5640	5670			
240	%N1	65.6	68.5	72.9	77.5	82.4		
	KIAS	226	226	226	226	226		
	FF/ENG	5300	5290	5250	5270	5320		
220	%N1	63.8	66.5	71.0	75.4	80.3		
	KIAS	220	220	220	220	220		
	FF/ENG	4940	4920	4880	4880	4930		
200	%N1	61.8	64.5	68.7	73.1	77.9	82.7	
	KIAS	213	213	213	213	213	213	
	FF/ENG	4580	4540	4500	4500	4530	4590	
180	%N1	59.6	62.4	66.3	70.8	75.4	80.2	84.8
	KIAS	206	206	206	206	206	206	206
	FF/ENG	4230	4190	4130	4130	4150	4180	4290
160	%N1	57.3	60.0	64.0	68.2	72.8	77.7	82.3
	KIAS	199	199	199	199	199	199	199
	FF/ENG	3880	3830	3770	3760	3770	3790	3870

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding

Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	78.9	83.8	88.3	94.3
	KIAS	242	242	242	242	242
	FF/ENG	7650	7690	7680	7800	8180
340	%N1	74.5	77.6	82.2	86.9	92.0
	KIAS	240	240	240	240	240
	FF/ENG	7290	7310	7300	7400	7690
320	%N1	72.7	75.7	80.2	85.1	89.9
	KIAS	233	233	233	233	233
	FF/ENG	6820	6820	6820	6880	7100
300	%N1	70.5	73.6	78.0	83.0	87.8
	KIAS	224	224	224	224	224
	FF/ENG	6310	6310	6300	6360	6490
280	%N1	68.4	71.6	76.0	80.8	85.7
	KIAS	218	218	218	218	218
	FF/ENG	5870	5870	5850	5910	6010
260	%N1	66.4	69.5	73.9	78.6	83.7
	KIAS	212	212	212	212	212
	FF/ENG	5470	5460	5430	5480	5550
240	%N1	64.5	67.3	71.8	76.3	81.4
	KIAS	206	206	206	206	206
	FF/ENG	5070	5050	5020	5060	5110
220	%N1	62.5	65.2	69.6	74.0	79.0
	KIAS	200	200	200	200	200
	FF/ENG	4690	4660	4620	4640	4690
200	%N1	60.2	62.9	67.0	71.5	76.2
	KIAS	193	193	193	193	193
	FF/ENG	4310	4260	4220	4230	4270
180	%N1	57.7	60.5	64.4	68.9	73.5
	KIAS	186	186	186	186	186
	FF/ENG	3940	3890	3830	3830	3860
160	%N1	55.2	57.8	61.8	65.9	70.5
	KIAS	179	179	179	179	179
	FF/ENG	3580	3520	3460	3430	3460

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down, Engine INOP — Section 46

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		VREF30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	308	254	5000	3700	1300
300	288	246	7100	6100	4500
280	269	238	9200	8500	7400
260	249	231	11200	10500	9400
240	230	225	13200	12600	11500
220	211	219	15200	14800	13700
200	192	213	17500	16900	15900
180	173	206	19900	19700	18600
160	154	198	22300	21700	20900

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	200		
330	1700		
320	3200	600	
310	4500	2400	
300	5500	4200	1300
290	6600	5500	3200
280	7800	6800	5000
270	8900	8200	6700
260	10100	9400	8300
250	11200	10500	9400
240	12300	11600	10400
230	13200	12700	11500
220	14300	13800	12600
210	15400	14900	13800
200	16500	16000	15100
190	17800	17100	16200
180	19000	18700	17400
170	20300	20100	19000
160	21600	21100	20400

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19
300	%N1	96.0	99.0						
	MACH	.413	.427						
	KIAS	250	249						
	FF/ENG	12977	13257						
280	%N1	93.5	95.6	98.8					
	MACH	.400	.414	.429					
	KIAS	242	242	241					
	FF/ENG	12015	12091	12444					
260	%N1	91.2	92.9	95.0	98.4				
	MACH	.387	.400	.414	.429				
	KIAS	234	234	233	233				
	FF/ENG	11137	11108	11216	11560				
240	%N1	88.9	90.6	92.3	94.7	98.4			
	MACH	.374	.388	.402	.418	.434			
	KIAS	226	226	226	226	226			
	FF/ENG	10249	10257	10303	10449	10806			
220	%N1	86.7	88.4	90.1	91.9	94.4	98.4		
	MACH	.364	.378	.392	.407	.422	.439		
	KIAS	220	220	220	220	220	220		
	FF/ENG	9466	9490	9517	9591	9723	10067		
200	%N1	84.1	86.0	87.7	89.5	91.4	93.9	98.1	
	MACH	.353	.366	.380	.394	.409	.425	.442	
	KIAS	213	213	213	213	213	213	213	
	FF/ENG	8676	8685	8711	8768	8843	8965	9313	
180	%N1	81.3	83.3	85.1	87.0	88.8	90.6	93.2	97.4
	MACH	.341	.354	.367	.381	.396	.412	.428	.445
	KIAS	206	206	206	206	206	206	206	206
	FF/ENG	7917	7917	7918	7967	8039	8106	8230	8570
160	%N1	78.4	80.3	82.2	84.1	86.1	87.8	89.7	92.2
	MACH	.329	.341	.354	.368	.382	.397	.413	.429
	KIAS	199	199	199	199	199	199	199	199
	FF/ENG	7154	7160	7151	7167	7230	7299	7359	7481

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
165	145	129	117	108	100	93	87	81	77	73
332	295	263	238	218	200	187	175	165	156	148
500	444	396	358	327	300	281	263	247	234	222
669	593	528	477	436	400	374	350	329	311	295
839	743	662	597	545	500	467	438	411	388	368
1009	894	795	718	655	600	561	525	494	466	442
1180	1044	928	838	764	700	654	612	575	543	515
1351	1196	1063	958	874	800	747	700	657	620	588
1523	1347	1197	1079	983	900	840	787	739	697	661
1696	1499	1331	1199	1093	1000	933	874	820	773	733

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.1	0:27	3.9	0:26	3.7	0:25	3.5	0:25	3.5	0:24
200	8.3	0:51	8.0	0:50	7.7	0:48	7.5	0:47	7.5	0:46
300	12.5	1:15	12.1	1:13	11.7	1:11	11.5	1:09	11.6	1:08
400	16.7	1:40	16.1	1:37	15.7	1:34	15.4	1:32	15.5	1:29
500	20.9	2:04	20.2	2:01	19.6	1:58	19.3	1:54	19.4	1:51
600	24.9	2:29	24.1	2:25	23.5	2:21	23.2	2:17	23.3	2:13
700	29.0	2:54	28.1	2:49	27.4	2:44	27.0	2:40	27.1	2:35
800	33.0	3:19	32.0	3:13	31.2	3:08	30.7	3:02	30.8	2:57
900	37.0	3:44	35.9	3:38	35.0	3:31	34.4	3:25	34.4	3:20
1000	40.9	4:09	39.7	4:02	38.7	3:55	38.1	3:48	38.0	3:42

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
5	-0.9	-0.7	-0.4	-0.2	0.0	0.5	1.0	1.5	1.9	2.4
10	-1.9	-1.4	-0.9	-0.5	0.0	1.1	2.1	3.2	4.2	5.2
15	-2.9	-2.1	-1.4	-0.7	0.0	1.6	3.2	4.8	6.3	7.9
20	-3.8	-2.9	-1.9	-1.0	0.0	2.1	4.2	6.3	8.4	10.5
25	-4.8	-3.6	-2.4	-1.2	0.0	2.6	5.1	7.8	10.4	13.1
30	-5.8	-4.3	-2.9	-1.4	0.0	3.0	6.0	9.2	12.4	15.6
35	-6.8	-5.1	-3.4	-1.7	0.0	3.4	6.8	10.5	14.2	18.1
40	-7.8	-5.8	-3.9	-1.9	0.0	3.7	7.6	11.7	16.0	20.5
45	-8.8	-6.6	-4.4	-2.2	0.0	4.0	8.3	12.9	17.7	22.8

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	96.1			
	KIAS	260			
	FF/ENG	15250			
320	%N1	94.0	98.2		
	KIAS	253	253		
	FF/ENG	14280	14490		
300	%N1	91.8	95.1		
	KIAS	244	244		
	FF/ENG	13280	13280		
280	%N1	89.9	92.9		
	KIAS	238	238		
	FF/ENG	12380	12370		
260	%N1	87.9	90.9	96.3	
	KIAS	232	232	232	
	FF/ENG	11520	11580	11870	
240	%N1	85.6	88.9	93.4	
	KIAS	226	226	226	
	FF/ENG	10680	10760	10880	
220	%N1	83.3	86.7	91.0	98.4
	KIAS	220	220	220	220
	FF/ENG	9870	9940	10020	10570
200	%N1	80.8	84.1	88.6	93.9
	KIAS	213	213	213	213
	FF/ENG	9060	9110	9170	9410
180	%N1	78.2	81.3	86.1	90.6
	KIAS	206	206	206	206
	FF/ENG	8270	8310	8330	8510
160	%N1	75.5	78.4	83.1	87.8
	KIAS	199	199	199	199
	FF/ENG	7490	7510	7510	7660

This table includes 5% additional fuel for holding in a racetrack pattern.

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

FMC Takeoff Speeds

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

Dry Snow

Enter the table with the dry snow depth and read the Equivalent Slush/ Standing Water Depth used to enter the Slush/Standing Water table.

Slush/Standing Water

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

(1) Determine the dry field/obstacle limit weight for the takeoff flap setting.

(2) Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.

(3) Adjust field length available for temperature by amount shown on chart.

(4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

(1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.

(2) If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

Slippery Runway

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will

appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Normal takeoff speeds, V1, VR, and V2 are read from the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

If takeoffs are scheduled using these simplified speeds in conjunction with airport analyses that include clearway and/or stopway credits, adjustments to V1 speed are required.

Adjust V1 by the amount shown in the Clearway/Stopway table. The adjusted V1 must not exceed VR.

The maximum allowable clearway limits shown on the takeoff speeds page are provided for guidance when more precise data is unavailable.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability at two center of gravity positions: 7.5% MAC (FMC default) for use when no center of gravity is entered on the PERF INIT page, and 30% MAC (typical mid cruise center of gravity) for use when 30% MAC is entered. Crews may interpolate between these values to determine the airplane's capability at other specific center of gravity positions. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target %N1, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target %N1, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of

braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC/320 KIAS speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative for Long Range Cruise and 320 KIAS. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

No takeoff speed adjustments or other performance adjustments are required for operation of EEC in the ALTERNATE mode. Power setting adjustments are only required for the takeoff thrust rating.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.